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What Industrial Engineering Includes

for

Industrial Executives

101 Things To Do

1001 Results Others Secured

Irving A. Berndt

Blue Book Series, No. 3

PRICE ONE DOLLAR

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FOREWORD

THERE have been many misunderstandings and misconceptions as to the scope of Industrial Engineering. From that definition which makes of Industrial Engineering the mere devising and installing of a system of records or the simple making of time-studies, up to that description and interpretation which is bold enough to include almost every phase of human endeavor, and at hundreds of stages in between, definitions have been offered.

Through these widely varying descriptions, have come many misunderstandings and many very erroneous impressions. It is not to be wondered at that the industrial executive of today, studying into this profession, has sometimes become rather confused as to just what field was covered, just what the aims and objectives were, just what the scope and limitations of Industrial Engineering really were.

It is, of course, logical that this condition exists at the present time. The entire development of this profession covers a period of only thirty years. Its members, including the pioneers, have naturally had some variance of opinions in the past. It is gratifying, however, that during the last ten years there has been a very steady and definite coordination of these various principles and practices until the time seems to be present when it is possible to offer an acceptable, if not entirely final presentation of what Industrial Engineering includes according to the best and most modern understanding, and according to the most up-to-date accepted principles and practices.

There has been an ever-growing demand among industrial executives for some such presentation as this book and the preparation has been accomplished to fulfill this demand, with the sincere hope that in its acceptance industrial executives will recognize that while it is an ambitious work, it is also an honest attempt to give them a reference from which they can most quickly analyze and ascertain complete information as to the scope of Industrial Engineering.

C. E. Knoeppel & Co., Inc., have attacked the task which resulted in this book with the sincere feeling that, because of its position in the field as one of the oldest professional organizations, it might well take the leadership in making such a presentation.

Mr. Knoeppel and many of his associates are among the oldest members of the profession. The company has a staff organized for Industrial Engineering service, dating back many years, and has now an established prestige and reputation for accomplishment which justifies it as an organization fully and authoritatively qualified to offer for the first time a comprehensive definition and description of the entire field of Industrial Engineering.

Only a Beginning

It is the intention of this company to consider this first presentation merely a basis for further researches and analyses and will aim to make from time to time such revisions of this book as will keep it up-to-date and make it possible to offer to all industrial executives interested a modern and timely conception of the scope of Industrial Engineering.

Realizing the necessarily large volume of material included in this description, a very careful and comprehensive set of indices have been developed for the aid of the reader in locating particular features in which he may be interested, so as to permit him to use this book as a continuous reference.

Suggestions as to the quickest methods of reference are included in the next section under the heading "Suggestions for Quick Reference."

As industrial executives study this subject and become further interested they are cordially invited to write C. E. Knoeppel & Co., Inc., for any further information regarding any particular classification, division, or phase of this subject included herein.

The complete indexing will make it possible quickly and easily to indicate the particular features regarding which further information is desirable.

We are also prepared and willing to arrange for a complete discussion either in person by Firm Member, Staff Engineer, or through correspondence as to the application of "Knoeppel Organized Service" as well as to substantiate the results claimed for the proper carrying out of this work.

Every Service Tested

Each and every one of the hundred and one divisions of service described can be definitely applied to industry, but it is not likely that all of them could be applied in every plant. Naturally, the possibility of application varies with the actual conditions.

As an organization, we are prepared to handle the installations of every one of these phases. It is natural, of course, that with some of the more popular, we have had the greatest and most often-repeated experience. Each and every result indicated as possible from the application of these various divisions of service can be definitely substantiated and supported.

Comments, criticisms, suggestions, and further inquiries are very welcome.

C. E. KNOEPPEL & CO., Inc.

Suggestions for Quick Reference

WITH the realization of the volume of material necessarily included in the description of what Industrial Engineering includes, this book has been carefully classified and completely indexed, both according to Divisions of Services and Results Obtainable, so that the busy executive can refer to that item in which he is particularly interested, under either of these two headings.

The Alphabetical Index of Service Divisions classifies the Divisions of Services alphabetically, giving a symbol-number as well as the page-number. For instance, if he is interested in the subjectof "Product Design", he will find in this index that he is referred to Service Division E-19, on page 108. Each and every one of the hundred and one divisions is classified and cross indexed so that he can easily find the page on which the Division of Services is described completely and the Results Obtainable indicated.

The Results Obtainable Index is an alphabetical indexing of all the Results Obtainable in the application of the various Divisions of Services. Here every result included is arranged and cross-indexed, and references given to the Service Divisions through the application of which the desired results can be obtained.

In many cases, to secure a certain result consideration must be given to the application of more than one, and in some cases, many divisions of service. However, if the student has in mind the result which he desires, he can, through reference to this index, quickly trace the Divisions of Service which will partially or

entirely secure this result. These Service Divisions are indicated by a capital letter and number symbol. To secure the page-number, reference must be made to the next index called the "Numerical Index of Service Divisions."

For instance, if the desired result is the "Development of a Proper Sequence of Orders", it will be found by reference to this alphabetical index, that the Service Divisions effecting this desired result, are indicated as D8 and F7.

By referring to the Numerical Index of Service Divisions, page-numbers covering these two Service Divisions can readily be found.

The Numerical Index of Service Divisions merely lists in numerical order, with the main letter prefixed, the hundred and one divisions, indicating in each case the page-number so that if the symbol is known from the Results Obtainable index, the page describing the Service Division can easily be located.

In inquiring for further information or discussion regarding these services or results, it will merely be necessary for the reader to mention to us in his correspondence the symbol, letter and numeral, or title of service, and we will be glad to furnish further details and descriptions of the actual application of these services, according to our practices and principles.

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A Conservation and Maintenance of Finance

A 1. Salvage Surplus Materials

Described as:

SYSTEMATICALLY determining quantity of excess or surplus materials, amount of scrap, and number of repair parts not needed, and then converting as much of it as possible into money.

Results Obtainable:

a Actual money saved usable for productive purposes.

b Reducton of investment for same amount of business done.

c Saves space and rent, sometimes even obviating new rentals of space or building of additions.

d Provides better working conditions because of 'house cleaning'.

e Encourages all employes by example in cleanliness, orderliness and thrift.

f Promotes more care in purchasing or in putting doubtful material into process.

A 2. Reduce Inventories and Requirements

Described as:

STUDYING carefully the manufacturing requirements of the business, to determine plans and policies covering the minimum quantities, amounts to order and maximums of the various kinds of material to carry, necessary to maintain a proper balance as between different kinds of materials, as well as an adequate supply of each kind required for regular manufacturing purposes.

Results Obtainable:

a Increased turnover of investment.
b Less unfinished order and lots.
c Less money tied up in least required materials and those more easy to secure.
d Better basis for economical purchase.
e In case of discontinuance of line or obsolescence, less loss through wastage.
f Less storage space required.

A 3. Equalize and Budget Burdens

Described as:

SYSTEMATICALLY comparing and analyzing overhead expenses, with the aim in view of determining not only where reductions can be made, but what the safe working allowances for each class of expenditure should be, to be used in checking same against actual expenditures, and providing for statement of reasons for increases and decreases.

Results Obtainable:

a Money saved in overheads, each dollar a complete gain, because excessive expenditures are pointed out.
b Operations are balanced because budget or allowance contemplates balanced activities.
c Necessary reductions are made proportionate and not at expense of one or other department.
d More enthusiastic and interested management with a goal to "shoot" at.

A 4. Institute Departmental Economies

Described as:

ANALYZING the work of such departments as maintenance, tool, inspection, experimental, power, cost, planning, drafting, employ-

ment, purchasing, stores and receiving, as the basis for determining what and where economies can be effected in the management and conduct of these departments.

Results Obtainable:

a Every dollar saved in these departments is one earned, provided activities remain just as effective.

b Such departments are those whose actual value is hard to measure, and although service departments are absolutely necessary, unless checked up, much money can be wasted if not properly controlled.

c Analysis often points out not only opportunity for money savings, but also for better service and more effective procedures.

A 5. Concentrate Managerial Personnel

Described as:

STUDYING the various divisions of the business, as to relationship, personnel and methods, with a view to consolidating, concentrating, coordinating and reorganizing in such a manner as to carry on the business as efficiently as before with less executive and managerial personnel.

Results Obtainable:

a Possible savings in managerial salaries.

b Possible better supervision with resultant savings in overhead, or more economical production.

c More enthusiastic and interested management because such analysis often, for the first time, really outlines responsibility.

d The opportunity for specialization often develops better executives.

A 6. **Stimulate Labor Savings.**

Described as:

DEVISING plans for locating inefficient employes in shop and office, so as to safeguard those who are efficient, and then determining the most constructive policies covering transfers, promotions, discharges, hours and wages as the conditions of the business may make necessary from time to time.

Results Obtainable:

a Inefficient employes are expensive and can be placed where they are more effective, with actual savings as the result.

b Employes can often be trained in present positions to produce more economically.

c Such analyses often bring to light expensive operators who in justice to themselves and their employers both, should have opportunities for more effective service pointed out to them.

d On the other hand, operators are sometimes found who consistently work better than all others and should be permitted to serve where they can bring greatest return to themselves and employers.

A 7. **Eliminate Unproductive Methods.**

Described as:

ANALYZING all office procedure and methods, with the aim in view of eliminating "red tape", duplications and unnecessary steps, and placing the methods on the most efficient basis so as to secure all possible gains.

Results Obtainable:

a Besides actual savings in dollars and cents, such analyses often point out opportunities for services to the directly producing

divisions and their managements, which result in further economies.

b Better workers are always the result of following procedures which are simple and direct. Few people really interest themselves in sluggish, confused and ponderous methods.

B Managerial Control

B 1. Provide Executive Conference Plans

Described as:

FURNISHING a mechanism whereby executives can periodically get together and, in a systematic and effective manner, coordinate the views of those who are charged with the responsibility of managing the business.

Results Obtainable:

a Develops coordinated management with all executives united in supporting various actions taken.

b More intelligent management, because through conference, opinions from various angles and viewpoints are secured.

c More enthusiastic management, because of realization that each executive is really a part of the whole, and is contributing to various decisions.

d Greater incentives for more interested and sound management, because of appeal to the best in each one when in competition while in conferences.

e More direct and effective management because once decisions are made in conference, definite action can be taken with no further arguments.

B 2. Create Betterment or Staff Departments

Described as:

ORGANIZING a staff or betterment department to study ways and means of doing things more efficiently; to act in an investigative and advisory way; and to develop new practices and formulate improved procedures.

Results Obtainable:

a A productive department whose gains are in each case money actually earned. Experience shows that no company exists which does not offer opportunity for better management.

b A basis for making studies and planning improvements, in complete detail, without hindering or disturbing necessary routine in carrying on current operations.

c Usually managers have in mind possibilities for money savings or betterments but for lack of time are unable to take advantage of them. Staff departments provide means of immediately cashing in on such worth while possibilities.

d Develops more cooperative and enthusiastic management because it provides a means of investigating and studying from all angles and at a given time the worthiness of suggested improvements from all sources at once.

e Encourages recommendations instead of allowing them to wait for months unexploited and never to be repeated.

B 3. Develop Organization Charts and Write-ups

Described as:

ANALYZING the different divisions of the business as to personnel and work done; observing where improvements can be made, and after securing approvals of revisions, preparing written outlines as to functions, duties and relationships, all of which information transferred in condensed form to charts, pictures the organization both as a whole and as to its various divisions.

Results Obtainable:

a The analysis itself points out opportunities for better use of personnel existing, the elimination of inefficient personnel or that which is unnecessary, the elimination of duplication of effort, those features and functions requiring more attention and effort, and any activities which are absolutely unessential.

b More effective management, because each individual having work defined, understands relationship to others, as well as his own scope, and can approach his task directly with no fear of interference.

c With each individual's responsibility outlined, the result is the building of stronger men in each position, because of the desire on their part to live up to these responsibilities.

d There is also an incentive to do better work, because a goal is set and a line of promotion is therefore definitely outlined.

e There is less disruption in organizations because of vacancies or absences since understudies can be designated, having definite instructions available covering positions to be filled, from which they can more quickly learn requirements.

f All vacancies can be filled more effectively, because with requirements of each position definitely outlined, individuals most suitable can be chosen, and with the use of these instructions can most quickly become familiar with new duties.

B 4. Budget Plant's Expenditures

Described as:

STUDYING the business from the standpoint of the necessary expenditures of the various departments, as a basis for working up the budget allowance covering the normal requirements, with provisions made for fluctuations due to changes in volume of business.

Results Obtainable:

a The very analysis often points out unnecessary expenditures, or indicates unbalanced expenditures where one department or division is spending all out of proportion to the others.

b Points out way toward applying available funds where they can be most effective and can bring greatest returns.

c Points out promptly, during depressions and when volume of business decreases, such items which are not being reduced in necessary proportions.

d Offers fair basis for judgment of responsible executives since it provides standards for them to go by.

e Offers better basis for use in predetermining costs and prices, with reasonable assurance that estimates so made will be met.

f With current and usual expenditures provided for through budget, the possibility and advisability of extra and unusual items can more easily be determined.

B 5. Establish Controllerships

Described as:

STUDYING the financial side of the business, as a basis for separating those features which are purely financial from those which are purely managerial, such as statistics, auditing, standard practice (as to office routine and clerical methods), general and factory accounting, and financial statements, and putting the latter under a controller subordinate to the general management.

Results Obtainable:

a More effective management, because of establishing a function devoting itself entirely to the accumulation of managerial data, as well as that of checking up and accounting for all expenditures. By relieving executive management from these details, each function can be handled more satisfactorily.

b By having all expenditures made by one group, checked and accounted for by distinctly another, a more acceptable and trustworthy accounting is provided.

c More information is available for use by management, because a controller has ability, time and facilities for securing and compiling such data in useful form.

d Management makes more use of data provided them from other sources, without any effort on their part, than they would if it were necessary for them to interrupt their own routine to secure it.

e A controller is specially trained in his work which assures the benefits of specialization.

B 6. Organize Statistical Department

Described as:

DETERMINING those factors in the business about which there should be reliable data, arranging for securing same by proper mechanisms, and finally for its compilation and presentation by a properly organized statistical division.

Results Obtainable:

a This eliminates the compilation of considerable data which is unnecessary, and insures the collection of such data as is useful.

b Where this work is not concentrated and each division compiles its own "pet" information, there is much duplication, which is eliminated by a centralized statistical department, which can use the same basic data for all compilations, merely rearranging it for use by different individuals and divisions as required.

c The compiling of statistics is a study in itself. By centralizing this work, it is possible to use highly specialized talent with the result that data is more satisfactorily compiled and presented.

d Through study of this work more simplified presentation will result, insuring more effective use of the data.

e Being relieved of this detail, operating departments can concentrate more time upon effective use of the data in current management.

B 7. Prepare Graphical Statistics and Statements for Executives.

Described as:

DETERMINING the pertinent and essential statistics which the executive requires; analyzing the financial and other statements for the salient features, and then arranging for weekly and monthly graphic presentations for executive use and study.

Results Obtainable:

a Makes more effective use of data, because of simplified presentations.

b Provides opportunity for very rapid and simple comparisons, which cannot so easily be read from tabulated figures.

c Indicates relationships in a way which can be secured in no other manner.

d Provides opportunity for publication of data, without divulging dollars and cents or other significant figures.

e Through use of various colors, lines and ingenious devices, the mind is forced to "stop, look and listen" at danger signs.

f Provides opportunity for quickly and emphatically pointing out danger signs.

B 8. Graph Procedures and Methods

Described as:

ANALYZING the procedures and methods in operation; determining those which are not important from the standpoint of use by or affecting executives, and arranging to reduce such procedures and methods to graphic form, placing them in convenient shape for accessibility and rapid reference.

Results Obtainable:

a Analysis itself points out opportunities for reducing duplication of effort, particularly complicated procedures which can be simplified, eliminations of forms, opportunities for combining two or more forms into one, and in some cases, elimination of extra copies.

b After procedures have been improved, the provision of definite standard instructions in simple form will insure their being followed more efficiently.

c Through being well defined, all arguments and questions can be more quickly settled regarding proper procedures.

d Procedures and forms become more effective when definitely outlined, because with little or no opportunity for change, working constantly along certain definite lines, individuals involved can carry out and use these methods more efficiently.

e Vacancies in organization can be filled more satisfactorily, because with procedures and methods outlined, particularly qualified individuals can be selected for vacant positions.

f Newcomers in the organization, by being provided with simple graphical descriptions of procedures and methods, can become familiar with their new duties much more quickly.

B 9. Strengthen Executive Personnel

Described as:

STUDYING the executive personnel through analysis of the work performed, also through interviews with officials, through questionaires, through tests and observational character analysis, if desired, to determine illogical functioning, faulty relationships and evidences of too many, or not enough, duties.

Results Obtainable:

a It is recognized that some men are qualified to fill certain positions better than others. This analysis aims to place each man in that position which he can most effectively fill.

b It eliminates certain functions which may be found absolutely unnecessary for effective operation.

c It emphasizes the need and brings to bear more concentrated effort on such functions as require particular attention.

d A better distribution of the work is provided, reducing the load where individuals are attempting to carry too much, thus making them more efficient, and distributing these extra responsibilities to such individuals who are not handling sufficient to keep them busy, thereby making them more contented and happy.

B 10. Institute Works Managerships

Described as:

STUDYING existing conditions as to manner of directing plant activities, ascertaining nature of present organization in charge of

managing operating departments, determining faults and weaknesses, and with the above as a basis, outlining ways and means for the better conduct of the plant, placing same under a single head—a works manager—after prescribing his functions, relationships and duties.

Results Obtainable:

a Concentrates under one head all responsibility for plant and works' operations, insuring more effective management.

b Through such concentration, it is possible to secure better qualified talent, which can specialize and therefore more effectively manage.

c It is recognized that works management is a field in itself, for one man's entire effort, and by providing such concentrated responsibility most effective management is assured.

d This work requires men with peculiar personal attributes and abilities and when so arranged for, such concentration permits the use of talent peculiarly qualified to meet the requirements.

e Through concentrating all plant functions under one head, the analysis points out any unnecessary functions as well as any neglected ones, and makes it possible to concentrate on those which are most important.

B 11. **Stabilize Production**

Described as:

ASCERTAINING the periodic high and low peaks in production and sales for a period of years; determining reasons for the fluctuations in production, as accurately as possible, investi-

gating as regards the various things which might be done to eliminate the excessively high and low points, with due consideration to the matter of advance orders, storage and financing; and working out a program for greater uniformity in balance and flow of production.

Results Obtainable:

a More balanced production results in greater production and lower costs.
b Eliminates expensive idleness of machines, men and plant capacities.
c Allows the development of a permanent organization of loyal, satisfied workers employed the year round.
d Reduces the use of inefficient floaters, each attempting to make a job last as long as possible.
e Offers opportunity for developing highly specialized equipment and processes, because investment can be kept busier, the year round.
f Offers opportunity for greater volume, because with all capacity used constantly on normal basis, costs are lower and therefore prices which will secure volume of sales, can be established.
g Insures a more economical turnover of money invested in materials-in-process.
h Offers opportunity for more economical purchase of material, in proper lots for steady and regular consumption.

B 12. **Outline Future Program**

Described as:

ANALYZING the present conditions in selling, financing, engineering, and in manufacturing, with due thought to the past successes and failures, as a basis for determining

the likely developments and progress of the future, which can serve to indicate the elements to be considered and to determine the tentative plan of action.

Results Obtainable:

a Provides an objective for all concerned in the organization, with more effective accomplishment as a result.

b Assures concentrated and definite activities, eliminating many haphazard and more or less ineffective operations.

c Broadens interest of all concerned, because future possibilities point the way for further promotions and effectiveness.

d By anticipating obstacles they can more easily be overcome, and by analyzing future requirements, many mistakes can be avoided.

B 13. Install Economic Research Departments.

Described as:

STUDYING the nature and needs of the business and determining the kind of information which would serve to advantage in enabling the management to plan future actions, ascertaining sources of such information, and arranging for its collection, compilation and use by executives.

Results Obtainable:

a Besides technical and statistical knowledge, management can often use and should be provided with information regarding general economics of industry in the country, outside of their own plant. An Economic Research Department

provides a mechanism for securing, compiling and presenting such data for use by executives.

b Proper knowledge regarding trade, market and labor conditions, new mechanical developments in industry as a whole and in each specialized industry, enables each executive to make more intelligent decisions and plan more effectually for the future.

c Develops proper executive management because the study of these features broadens the individual.

d Many opportunities for development of the given industry are pointed out, and can be taken advantage of through study of this information.

e The activities of competitors can be watched, to a certain extent at least, and any inroads prevented.

f Many lessons can be learned from industries not exactly the same, but having similar problems.

C Accounting Control

C 1. Determine Standard Burden Rates

Described as:

SETTING up standard burden rates by departments or class of equipment, based on the normal operating capacity of department or class of equipment, which will serve as a basis for comparing actual burden costs, and assisting in reconciling the differences, due to operating at greater or less than normal capacity, and also for setting current prices.

Results Obtainable:

a Through current comparisons any wide fluctuations of actual from standard burdens can be noted and investigated, and the recurrence in many cases prevented.

b By reflecting normal operating capacity and conditions in standard burdens with such burdens being used for setting prices, a price basis is established which will secure business in such volume as will most effectually attain and maintain the much desired normal conditions.

c When prices are set on a basis of actual burdens during previous periods, they are apt to be very inaccurate because present and future conditions are not anticipated. Standard burden rates do make some prophecy and therefore establish price estimates with more accuracy.

d Prices are usually fixed during the month. If actual burdens are used, pricing and billing is delayed until the end of the

month, when such actual burdens can be compiled and where charges overlap from month to month, which results in added confusion. Standard burden rates obviate this also.

C 2. **Develop Codes of Standing Expense Orders**

Described as:

ARRANGING for the development of a logical code of expense orders, by departments, and kinds of expenditures, properly classifying such expenses, and providing a proper system of numbering and finally arranging for their presentation in statement or other convenient form for quick and ready reference.

Results Obtainable:

a Assures each item of burden or expense being charged to the same account in every single case, eliminating all hesitance, arguments and discussions as to where it belongs.

b Provides basis for effective comparisons, pointing out accurately all variations and fluctuations.

c By studying analysis of such statements, wide increases can be immediately noted and investigated.

d Study and use of information tabulated in such codes of accounts, usually results in actual reductions in overheads. With all expenses of a given nature always charged to the same account, and so tabulated, a better and more intelligent judgment of operations is insured every executive , or department head and sub-executive.

e After such items have been classified and tabulated for some time, standards can be set up for each one, as a basis and guide for each executive responsible.

f Furnishes statements of untold benefits to the responsible heads of departments.

C 3. Merge Cost and General Accounting.

Described as:

ANALYZING both the cost and general accounting systems and then planning for such changes as may be necessary to co-ordinate them, after which the work of merging the two, would be undertaken.

Results Obtainable:

a Provides an absolute check as to accuracy for all cost figures, because if costs are not checked through, merging them into general accounts which are verified, they become merely memoranda of doubtful importance.

b There is greater incentive for executives to use cost information, which they know is verified, as compared with information which includes certain questionable points.

c The verification emphasizes the importance of the expenditures made. If executives know that each dollar spent is being accurately accounted for and verified, they will more carefully consider the expenditures and have more respect for their responsibilities as executives.

d Permits of accurate monthly statements of assets, liabilities and profit and loss.

C 4. Provide Burden and Financial Statements

Described as:

ANALYZING the accounting methods, both cost and general, and compiling proper burden and financial reports from the figures shown, arranging for their proper presentation, showing comparisons for analysis and use by executives.

Results Obtainable:

a Proper burden and financial statements insure the use of cost information, which alone makes it valuable.

b Permits and encourages concentration on such comparisons as will facilitate more effective management, and assure attention to necessary details.

c It develops more enthusiastic and interested management, because with information available, it can be made to represent the score board of the game, and bring a greater interest to the daily job. In this way, they show results in which every full-blooded American executive is interested.

d They can be made to show prophecies for the future, and become a guide for future activities.

e By indicating standards and by watching fluctuations of actuals from standard and all other variations, they offer a basis for most effective control by management.

C 5. Establish Idleness Records

Described as:

PROVIDING the means for periodically analyzing and presenting the cost of idleness due to lost time by workers, and the idleness of machines and floor space; this idleness cost to be classified both according to location of idleness and causes of same, in this way separating the inefficiency of management from that of labor.

Results Obtainable:

a Offers a basis for cutting down absolute losses, through elimination of the causes of idleness of equipment, men, and plant capacity, which is variously estimated at from 30 to 60 percent in average cases.

b Points out such instances where idleness is consistently so great, that capacity can be dispensed with entirely, and work performed otherwise, thus reducing investment.

c Through study of idleness, inefficiencies of management are separated from those of workers, and each can by careful investigation, be reduced to a practical minimum.

d A study of causes of idleness offers as a basis for improvement, all such factors as are indicated as disturbing elements, such as lack of material, improper handling of material, insufficient equipment maintenance, insufficient number of workers, poorly trained workers, incomplete instructions, and many others.

When improved for the individual case, the entire system can be improved, thereby effecting betterments in a widespread manner.

e Study of idleness of machines and the causes often opens opportunities for improving mechanical features of the equipment itself.

f Study of idleness of equipment and plant capacity often points out ways of using this capacity for other purposes, by addition of new lines of manufacture.

g In many cases such a study points out results in the disclosure of a great amount of floor space which can sometimes be rented, or can in some cases be used for other purposes where it is badly needed.

C 6. Analyze Rejections

Described as:

STUDYING all rejections whether caused by defective material or faulty workmanship, analyzing same and presenting the cost of rejections, according to causes, products, vendors, workers and departments, thereby showing in the proper way the cost of material wastes as distinct from the cost of idleness.

Results Obtainable:

a Provides basis for analysis of causes of losses due to rejections, either entirely or partially, indicating possible reductions. Every dollar which is saved is money earned.

b Indicates through analysis poor workmanship and inefficient workers who should be trained; on the other hand pointing

out good workers whose work is not rejected and who should be properly rewarded.

c Indicates possibilities of better use of material, or on the other hand, use of better or different material to prevent wastage.

d With positive records available, it provides a better basis for judgment of the net accomplishment of individual workers, foremen, inspectors, divisions and departments.

e A campaign against unnecessary rejections sets an example and standard of quality, which has a definite psychological effect on the work of everyone in the plant.

C 7. Install Labor Accounting Methods

Described as:

DEVISING the most modern payroll methods which will show what has been spent for labor of all kinds, where it was spent, what it was spent for, and to whom it was paid.

Results Obtainable:

a Productive labor is probably the greatest resource in the world, but there is amazingly little known about it. Proper payroll methods provide data from which the necessary knowledge can be secured.

b It provides a basis for checking the supervising executives, foremen, etc., as to their use of labor, and the application of it against various activities, thereby assuring that each worker is permitted to apply himself in his most productive capacity.

c Positive records regarding labor costs provide a basis for judging the accomplishment and activity of the individual worker, on an intelligent and fair basis, as compared with haphazard, unfair and often prejudiced judgment.

d Payroll records offer a basis for judgment, regarding all changes in individual wage rates, including increases in the individual case, and adjustments of wage scales in general.

e Payroll records are one of the fundamental bases from which to compile and check all labor costs, around which manufacturing costs are established.

f Time records, as a part of payroll records, establish a fundamental basis for burden distribution.

C 8. **Create Equipment Inventories**

Described as:

CREATING an equipment ledger with such figures as to value as can be secured, which ledger will show for each piece of equipment, the original or appraised cost, and the present worth, with provision for showing repairs, betterments and depreciation.

Results Obtainable:

a Provides a basis for determining actual worth and investment in equipment, for use in accounting practice and income tax returns.

b Provides a basis for judgment in purchasing new equipment.

c Provides basis for judgment in scrapping and discarding present equipment.

d Provides basis for depreciation charges, and the current costs.

e Provides basis for judging efficiency of machine through records of repairs.

f In case of contemplated sales, it provides a definite basis for establishing actual value.

g Provides basis for settling insurance claims.

C 9. **Take Material Inventories**

Described as:

ARRANGING the periodic taking of physical inventories, supplying the forms necessary to take same, with full and complete instructions, and supervising the pricing, checking and presentation of inventory values.

Results Obtainable:

a Provides basis for establishing actual valuations, to be used in accounting procedure and income tax returns.

d Establishes a definite basis for controlling materials used, purchased and stored.

c Indicates surplus materials which can be salvaged.

d Indicates rejected materials which can be salvaged.

e Facilitates control of necessary minimums and maximums to be carried, resulting in economical purchase and assurance that necessary materials are on hand when needed.

f Facilitates check upon proper use or wasteful uses of material; also checks charges of material against work performed.

g In case of contemplated sale, provides basis for establishing actual present values.

C 10. Devise Improved Office Procedures and Methods

Described as:

ANALYZING office routine as to personnel and methods, and deciding as to rearrangement in offices, betterments in methods and procedures, changes in personnel, and general direction of office work.

Results Obtainable:

a The very analysis of office routine often indicates possibilities for savings in this expense, which, since it is an indirect item, becomes actual money earned.

b Being a service department to facilitate all the work of the operation departments, all improvements indirectly facilitate the work of the operation departments.

c The office is looked up to by the plant workers and if it sets the example of orderliness, simplicity, and effectiveness, this will be reflected in the plant conditions.

d Efficient office routine will result in more effective management, because executives who can turn for details and general routine, to a proper office system, will have more time for the constructive work of managing and directing.

e All office records are valuable only insofar as they are used, and records which are delayed or behind time, are merely historical and have very little current value. Simple office routine provides

that such records must be kept absolutely up to date for immediate and current use.

f Eliminates duplication of effort and routine, indicating possibilities of using each original record, statement, form, or mechanism for as many purposes as possible.

g Indicates possibilities whereby concentration of similar types of work, mechanical devices and more economical methods can be used—for instance, electric tabulating machines, and the like.

C 11. **Write Up Standard Practice**

Described as:

STUDYING the various production, cost, accounting and office methods and procedures, and developing and putting into written form, standard practice instructions covering them.

Results Obtainable:

a Assures constancy and accuracy in records, statements, and work produced through the office methods.

b Eliminates confusion, discussion and arguments regarding proper procedures.

c Establishes simple basis for extension of these methods when necessary, preventing duplication.

d Assures most effective use of clerks, by definitely outlining procedures and duties for each one.

e By combining work of a similar nature, and definitely describing it, provides opportunity for specialization, which results in more economical operation.

f In case of vacancies, with requirements of various work outlined, permits a better selection of clerks qualified for the work.

g In case of vacancies, provides a basis for more quickly training new clerks, as to requirements and procedures and duties of vacancies, as well as relationship to work of other positions.

C 12. Set Machine Rates

Described as:

STUDYING equipment as to classes and units, analyzing cost elements entering into their operation and setting up hourly machine rates which will consider rent, power, depreciation and maintenance, along with rental charges for working places.

Results Obtainable:

a Provides basis for measuring the value of expense of equipment used.

b Provides basis for indicating in dollars and cents, the cost of idleness of equipment.

c Provides basis for judgment in assigning equipment for performance on various operations.

d Provides basis for estimating costs, and therefore sales prices, on work in prospect.

e Provides more accurate basis for costing and pricing work produced on the various machines.

f Indicates opportunities for savings where work formerly accomplished on expensive machines can more economically be done on those which are less expensive.

g Establishes a method of distributing burden items, which are often lost track of or improperly cared for when other methods are used.

C 13. Modernize General Accounting and Cost Methods

Described as:

STUDYING wherein methods of accounting and cost fail to compare favorably with the most advanced practice, and outlining and putting into effect the changes which may be necessary to place same on the most modern basis.

Results Obtainable:

a Progress is being made daily in connection with new developments in accounting and cost practice. A study will point the way to making such methods most up-to-date and effective.

b Analysis will indicate possibilities for elimination of duplicate effort, and oftentimes show where certain individual elementary records may be used simultaneously for several different purposes, eliminating one or more compilations of such original data.

c Assures certainty that all such records are coordinated and verified, since without such check they may be inaccurate and useless.

d In modernizing presentation, records formerly used to only a limited extent can be humanized and made interesting thereby developing them to their fullest value.

e The compilation of all worthless information can be eliminated and only such data as is significant can be provided and emphasized.

C 14. Audit General and Cost Accounts

Described as:

MAKING monthly, quarterly, semi-annual or yearly audits of general accounting and costing with reports showing exact condition of business and recommendations covering betterments.

Results Obtainable:

a Assures the constant accuracy of all entries.

b Points out inefficient or unreliable, as well as any dishonest manipulations of figures and records.

c Safeguards the judgment and decisions of the management against any disturbing facts or influences.

d Brings out opportunities for improvements in methods.

e Provides a basis for financial reorganizations or adjustments.

f Safeguards investments already made, as well as those which are contemplated.

C 15. Develop Control Accounts

Described as:

ANALYZING nature of business, methods of manufacturing, accounting and costing procedure, and outlining the number and kind of controlling accounts which should be used, as well as preparing written instructions covering debit and credit entries to controlling accounts, also arranging to supply the proper information for entry.

Results Obtainable:

a Provides the means of controlling all accounts in order to operate safely and accurately the various asset, liability and expense accounts which make up the monthly statements.

b Assures every expenditure, either current expense, investment, or of whatever nature, being charged in every case to exactly the same account.

c Eliminates all confusion, discussion, or arguments as to proper credits and debits.

d Provides a definite and fair basis for judgment of management responsible for various expenditures.

e With accuracy and consistency assured in charging, the management has a basis for comparisons, period by period, one account with the other, so as to judge the advisability and effectiveness of the various expenses in order to study and eliminate variations and fluctuations where possible.

f Provides a basis for setting up standards, and by measuring actual against such standards, definite control of all expenditures can be established.

g Provides a basis for planning future investments and expenditures.

C 16. Outline Basis for Unit Costs

Described as:

STUDYING nature and needs of the business, determining way costs are compiled, ascertaining the nature of general accounting, and prescribing the procedure to get costs on the

correct unit basis, whether operation, parts, process, class, orders, or products.

Results Obtainable:

a Establishes basis for accurately distributing each item of cost against a practical and recognized unit of production and sale.

b This assures accurate charging of expenditures to the same unites in all cases.

c Provides a basis for establishing proper prices on units produced, or on estimated prices per unit to be produced.

d Provides basis for comparisons, one unit with the other, or periodical productions of the same units, to be used by management in reducing costs.

e Provides a basis for the setting of standards against which actual accomplishments can be measured, and any wide fluctuations noted, accounted for, or reduced.

f Provides a basis for judgment as to any contemplated changes in methods of production, new processes, purchase of equipment, or changes in facilities.

g Provides a basis for fair judgment of all workers involved in production of the unit.

D Sales Control

D 1. Determine Unexploited Sales Possibilities

Described as:

PROVIDING a means whereby careful and systematic study can be given to the matter of increasing sales through analysis of plant and equipment capacities, product data, market conditions, territorial requirements, costs and prices.

Results Obtainable:

a Gives sales department information regarding any unused plant or equipment capacities, indicating whether or not these could be used on regular line of manufacture, and, if not, what kind of work would be most desirable.

b Provides incentive to sales department to increase sales through efforts to secure orders which will use this unused plant and equipment capacity.

c Analysis of product will indicate whether there is a wider use or market for it, in its present design or with some slight changes.

d Study of market conditions will indicate whether or not any markets are unexploited and to what degree, as well as to point out any industries or localities where sales effort is not all that it might be.

e Will indicate whether or not all advisable territories are being covered; whether there is sufficient concentration on those offering best results; whether methods of

covering territories are adequate, and finally whether sales in each territory are in correct proportion to possible requirements.

f Will indicate effective price on volume sales, particularly where price is affected by costing plan, burden distribution, or profit adjustment.

g Will place in the hands of sales force, knowledge of operating conditions, market conditions, basis of cost and price—first, as a guide in applying sales effort and second, to use as arguments in individual selling, advertising and sales campaigns.

D 2. Capitalize Undeveloped Profit-making Possibilities

Described as:

ANALYZING the various elements which enter into profits, as for instance, relative complication, as a basis for determining constructive policies looking toward increasing the net returns.

Results Obtainable:

a Will indicate relative complexities and therefore variations of cost of different commodities produced, particularly high labor cost articles as distinct from high material cost articles.

b Will indicate any possibilities of simplification in design or methods of manufacturing.

c Will indicate on which particular lines greater pressure should be brought to bear in

sales effort, in order to secure balanced volume, which will accrue greatest profits.

d Will indicate most complicated and costly products, on which price could be increased, either immediately or thru gradual education.

e Will give sales organization complete knowledge of basis of manufacturing, also costing to be used as a guide in sales effort, as well as for arguments in closing sales, and in sales campaigns.

D 3. Locate Unprofitable Lines

Described as:

CAREFULLY studying the unprofitable items and reasons for same, with the aim of either eliminating them or reducing them to a minimum, thereby allowing for concentration on the more profitable lines.

Results Obtainable:

a Will point out on which lines or product special effort should be concentrated, to reduce cost through a simplification of design or processes.

b When cost is at a minimum, it will indicate to sales department all items showing no profit, and will bring such unprofitable lines as may be eliminated, to attention for decision on this point.

c Where unprofitable products must be continued to complete a line, will point out forcibly to sales department the need of keeping such orders, at a minimum.

d Will provide basis for control of sales effort and order acceptance, to insure

that losses from unprofitable lines will not exceed profits from those which are profitable.

e Will provide basis for gradual education of competitors and general trade, for the acceptance of such increased prices as will show profits.

f Will provide sales department with added arguments to be used in pointing out to customers such actual losses as an indication of effort to maintain good will.

D 4. Reduce Lost Sales

Described as:

PROVIDING a mechanism for analyzing lost sales as to territory, salesmen, product and causes, thereby meeting competition more intelligently and forcefully.

Results Obtainable:

a Will guide all sales effort, furnishing a program for concentration.

b Will set up a goal in various territories for individual salesmen to attain.

c Provides a basis for intelligent judgment of the ability of the various groups of salesmen.

d Provides basis for more intelligently assigning salesmen to various territories.

e Indicates opportunities for possible revision of territories to provide more effectual concentration.

f Furnishes basis for adjustments in sales force and organization, showing whether or not more salesmen are needed, or how the present force can be shifted to more effectually cover the ground.

g Indicates possibilities for improvement of product design or quality.

h Indicates any need for price adjustments.

i Indicates any need for improvement in deliveries.

j Indicates any necessity for adding additional products to make the line complete.

k Indicates need for closer followup of quotations made.

D 5. Adjust Prices

Described as:

CONSTRUCTIVELY studying the matter of prices and their relation to costs, plant capacity, demand, competition, and nature of product, as a basis for determining intelligent and logical adjustments in same.

Results Obtainable:

a Gives assurance that prices are based on proper and accurate cost methods, which truly reflect operation costs.

b Gives assurance that all factors are properly distributed, and that profitable and unprofitable lines are evenly divided.

c Indicates any possibilities for reduction in prices, to secure greater volume, by more complete use of full plant capacity.

d Points out nature of price competition, how it can be met, and to what extent justified.

e Provides sales department with intelligent information, as the basis for judging in individual cases where large orders can be secured through slight adjustments in price.

f Points out possible changes or simplifications of product design, or methods of manufacture, or quality, which might result in reduction of price and increased sales.

g Gives sales department complete knowledge of price and cost basis to be used as a guide in applying sales effort on various lines, and from which to draw arguments for closing sales in an advertising campaign.

D 6. Coordinate Sales Effort with Factory Conditions

Described as:

ARRANGING for knowledge of orders ahead through analysis of congestion and excess capacity according to departments, type of equipment or product, as a means of forecasting where sales pressure will have to be exerted, or where too much has been sold.

Results Obtainable:

a Gives sales department advice as to exact conditions as a guide in expenditure of sales effort, so they can secure such business as can be most profitably manufactured, from time to time.

b Points out any unused capacity, as an incentive to sales department to secure such orders as will make use of it, on a profitable basis.

c Provides information as a guide to sales department, in making delivery promises, showing possibilites on the one hand of offering best deliveries which may secure desirable orders; on the other hand, of the necessity to secure sufficient time for delivery of orders.

d Will point out to the sales department, that because of impossible delivery promises, orders must be crowded through the plant on an expensive cost basis, even to the extent of becoming unprofitable.

e Keeps sales department advised at all times, as to which lines of manufacture must be pushed to keep plant balanced.

f Furnishes a basis for future program of activity of sales department, as to size and type of organization needed, price adjustments, and general sales campaign.

D 7 Predetermine Selling Cost and Price

Described as:

ORGANIZING the work of estimating costs on new orders, based on cost rates reflecting the normal capacity of plant or department, thereby securing a larger volume of sales than if actual costs were used at a time when plant was operating at reduced capacity.

Results Obtainable:

a Increases volume of sales to as near normal capacity as possible because prices will reflect normal condition.

b Provides intelligent basis for accurately estimating on prospective work, assuring fair competition on desirable work.

c Increases volume of profitable work secured.

d Reduces amount of unprofitable work taken.

e Points out emphatically any orders accepted at low profit, or at no profit so that costs can be kept to a minimum in such cases.

f Assures basis of prompt estimating and bidding on work so as to assure consideration.

g Gives sales department complete basis for judgment in sales effort, as well as for adjustment in prices where necessary to secure desirable order, or to secure volume.

h Eliminates arguments and confusion resulting from varying opinions as to what estimates should be.

i By providing standard estimating tables and schedules, simplifies procedure and eliminates much unnecessary clerical effort.

D 8. **Improve Deliveries**

Described as:

DETERMINING proper delivery promises, scheduling same, and planning for proper and efficient follow-up, as an aid in shipping orders as close to delivery dates as possible.

Results Obtainable:

a Increases volume particularly where delivery is important basis of competition.

b Assures satisfied customers by making only such promises as can be met.

c Provides sales department with intelligent basis for making delivery promises.

d Eliminates all arguments between sales department and operating department, as to proper delivery promises.

e Eliminates a great deal of unnecessary clerical effort, "chasing", and following up work.

f Definitely decides proper sequence and importance of various orders, with no post mortem arguments.

g Reduces cost by a reduction in costly changes in production schedules, where jobs are often interrupted for special or rush orders.

h Keeps any particularly desirable rush order in its proper place of importance, and is concentrated upon.

i Provides basis for decision as to such sequence of orders, as will keep greatest number of customers satisfied, as well as fulfill promises of sales department, and at the same time provide most economical manufacturing costs.

D 9. Develop New Lines

Described as:

ANALYZING plant conditions, equipment, and product made, as a basis of determining what additional lines of manufacture plant should logically arrange to secure, and then locating where such lines are.

Results Obtainable:

a Indicates possibility of adding new lines which will make use of any unused or unfilled capacity.

b Indicates any new lines which may make it a profitable investment to purchase additional equipment and reduce general everhead, thereby reducing costs on all production.

c Will indicate new lines which will make it a profitable investment to purchase new equipment which can be used for part time on present product to reduce its cost.

d Will indicate new lines which will make range of product complete, and facilitate securing orders, because of ability to furnish such complete range.

e Will indicate new lines which can be effectually sold in conjunction with present line, thereby reducing sales expense.

f Will point out such additional lines as will carry sales effort into desirable territories and markets.

D 10. Apply Unused Publicity Factors

Described as:

STUDYING from an engineering viewpoint, where possibilities exist for placing before prospective customers, the best arguments as to merits of the products, results to be secured, qualities, deliveries and other factors influencing sales, all to be presented in a convincing manner, written or graphic, for use by the advertising manager or the advertising agency, or other interested executives.

Results Obtainable:

a Will assure complete presentation of all sales arguments and improve sales effort.

b Will provide a basis for developing such publicity as will offer a better background for concentrated sales effort.

c Will provide basis for better education of salesmen, in their knowledge of the product they are selling.

d Will in many cases because of study and analysis, develop suggestions for improvement of product for its wider application.

e Will in some cases indicate new applications and new markets for product.

f Will offer basis for concentration of sales force, in those fields or markets where product can best be applied and greatest volume secured.

g By graphic presentation, will assure use of information in all advertising campaigns, and in all sales efforts.

h Careful analysis will often bring out new merits, or advantages of product hitherto unknown.

D 11. Ascertain Export Possibilities

Described as:

STUDYING type of products, uses,markets, and other pertinent features in connection with the distribution of the goods manufactured; collecting information as regards conditions abroad, possible markets, data as to exchange, packing and shipping requirements, all to serve as a basis for indicating the possibilities in exporting parts of the product manufactured.

Results Obtainable:

a Will determine for the future, complete sales program as to possibility of export field.

b Where export markets can be added, will provide basis for increased volume, which will fill in unused capacity.

c Through increased volume, overhead can be reduced, resulting in lower prices and better basis for meeting local competition.

d Will offer opportunities for expansion of entire line of product.

e Will offer outlet for production, when local conditions show depression.

f This study will also indicate information, as to nature of any existing foreign or possible competition, either here or abroad.

E Technical Control

E 1. Standardize and Improve Use of Equipment

Described as:

STUDYING machines as to class, nature of work performed, material used, and developing standard practice, with working charts which can be used to secure maximum results by workers, foremen and inspectors, covering the best speeds, feeds and cuts under varying conditions, for different kinds of material.

Results Obtainable:

a Accomplishes actual savings in cost of production.

b Provides basis to production department, for assignment of the various operations to equipment, specifying best equipment to use, and first or second alternative, if the best equipment is already loaded with work.

c Indicates possibility of improving design of equipment itself, in order to make its use more profitable.

d Indicates possibility of increasing speeds and feeds of equipment, so as to increase its productivity.

e Eliminates all arguments or confusion as to best use of equipment for different purposes.

f Provides instructions so that each particular piece will be performed in exactly the same way each time, and according to best practice.

g Eliminates all haphazard judgment of foremen, workers, and inspectors, which

may or may not constitute most economical practice.

h Provides basis for better judgment of workers by foremen, inasmuch as judgment will be based on performance of established best practices, rather than arbitrary personal judgment.

i Provides basis for more quickly training new workers to the best operation of the machines and equipment.

j Assures use of material and product, which will result in most economical manufacture, indicating in some cases where a better grade of material can be used, resulting in a savings in processing, which will more than make up for the increased cost of material.

k Establishes basis for developing proper standard hourly productions of each machine, for use in measuring capacity, and through production control indicating idle capacities.

l By standardizing and limiting use of machines, results in less repairs and fewer breakdowns, resulting in more economical maintenance and longer life of equipment.

E 2. Design and Use Standardized Cutting Tools

Described as:

ANALYZING the cutting tools in use, as to work done, kind of tool steel and cutters purchased, and the practice as to operation in cutting metals, as a basis for determining and

standardizing the practice as to the cutting materials to use, the forging, shapes and angles, and grinding; presenting the results in both written and chart form.

Results Obtainable:

a Reduces actual processing cost.

b Eliminates all arguments and confusion as to proper manufacture, grinding, shaping and the use of cutting tools.

c Provides basis for production department to assign work to machines equipped with tools which will result in most economical production or, if such tools are in use, for assignment to first and second alternative.

d Provides basis for improving from time to time the designs of such tools as will result in the most economical production.

e Indicates possibility for changing tools, tool shapes or methods of grinding, and machines themselves so they can be used to better advantage with possibilities of increasing speeds and feeds.

f Provides instructions which will assure work being performed in each case in exactly the same manner, with resultant higher quality of work and most economical production.

g Eliminates all haphazard judgment of foremen and workers which may or may not be the best practice.

h Establishes basis for more quickly training new operators and workers.

i Assures most economical use of material, indicating in some cases where more expensive material or product can be used, at a savings in cost of processing, which will more than make up for increased cost of material.

j Indicates proper material to use in tools themselves for various kinds of work which will result in more economical production, as well as lesser tool cost.

k Indicates in some cases where more expensive tool will outlast many times cheaper tool and also save in processing cost.

l Provides a basis for establishing standard hourly productions, to be used by production department in planning, scheduling, dispatching and general control.

m Results in less waste of tools themselves, and more economical tool maintenance.

n Centralizing the grinding and reshaping of tools results in considerable savings and less idle equipment, eliminating delays to the operators and machines.

E 3. Develop and Use Jigs and Fixtures

Described as:

STUDYING the various operations performed, observing the class of equipment worked on, and the nature of jigs and fixtures used, and advising as to the betterments in practice, which will reduce operating times, with arrangements for making drawings or sketches for the various designs of jigs and fixtures advocated, along with instructions as to their use.

Results Obtainable:

a Accomplishes actual savings in cost of manufacture.

b Eliminates much confusion and arguments as to best practices.

c Secures greater productivity per hour for various machines which, in cases of expensive equipment, amounts to a great deal.

d Indicates possibilities of improvements in design of equipment, so that jigs and fixtures can be used most effectually.

e Provides basis for quickly training operators to make best use of equipment.

f Eliminates haphazard judgment of foremen and workers, as to best practice.

g Provides basis for standard hourly production times to be used by production department, in assigning work, and in general production control.

h Saves wear and tear on equipment and reduces maintenance expense.

i Eliminates much expensive rehandling of parts and materials.

E 4. Analyze and Rearrange Plant Layout

Described as:

ANALYZING the layout of plant, and determining the arrangement of equipment and the working facilities furnished; observing the flow of product through departments and equipment, and after giving careful consideration to the relation of product flow to layout and arrangement of plant, preparing recommen-

dations covering such changes and relocations as will eliminate the faults observed.

Results Obtainable:

a Results in reduction of operation costs, eliminating expensive handling and re-handling of materials and parts.

b Assures quicker turnover of material-in-process.

c Reduces actual length of time for product to go thru complete process of manufacture.

d Establishes better conditions for workers.

e Provides in many cases, better lighting and therefore more economical production.

f In some cases eliminates and makes obsolete, any equipment which is rarely used.

g Indicates any extra space which may be used for other production, or in some cases, sublet at a profit.

h In some cases eliminates the necessity for additional space and investment therein.

i By eliminating congestion and haphazard handling, reduces accidents to workers.

j In many cases where accident hazard is reduced, actual reductions in liability insurance are the result.

k In some cases it reduces fire risk with the resultant reduction in insurance cost.

l Provides basis for more effectual control of production.

m Provides basis for more satisfactory material control, eliminating haphazard storing of raw materials and materials-in-

process, often preventing much waste through temporary or complete loss of materials or parts.

E 5. Institute Anticipative Inspection and Maintenance

Described as:

OBSERVING condition of plant, equipment and tools; studying the organization which looks after maintenance, analyzing to what extent breakdowns and repairs out of working hours are anticipated, observing to what extent there is inspection of facilities in order to keep cost of maintenance at a minimum, and then developing the organization of an efficient maintenance department, the basis of which would be a periodic and logical anticipative inspection of equipment and facilities, along with the development of records and reports covering the work.

Results Obtainable:

a Anticipates many costly breakdowns, with resultant expensive idleness of machines and equipment.

b Through discovering minor breakages which can be repaired out of regular hours, allows machines more continuous operations.

c Reduces cost of repairs themselves, and prevents many expensive repair jobs.

d Reduces the expense for repair parts.

e Extends the life of equipment itself.

f Permits a more continuous balanced production, and more effectual control of production.

g Accomplishes more definite carrying out of delivery promises.

h Reduces actual cost of production where, because of breakdown of one machine, work must be made in a more expensive way on equipment less adapted.

E 6. **Study Power, Generation and Transmission**

Described as:

ANALYZING the equipment and methods used in generating and transmitting the various kinds of power, observing where losses are occurring, and recommending such physical changes or betterments in methods as will reduce power costs.

Results Obtainable:

a Reduces actual cost of power generation.
b Assures continuous performance of equipment, eliminating expensive idleness of plant capacity.
c Reduces cost of fuel.
d Permits use in many cases of improved equipment, with resultant reduction in operation costs.
e Eliminates losses in generating power, every dollar of which represents a dollar earned.
f Reduces cost in transmission of power, which money is likewise a positive saving.
g Eliminates any entire shutdowns of all equipment, which is expensive and interferes with keeping delivery promises.
h Makes it possible to use certain equipment to better advantage, operating at higher speeds.
i Reduces cost of maintenance of power plant equipment.
j Extends the life of power equipment.

E 7. Apply Better Inspection

Described as:

ANALYZING process and final inspections, observing facilities used in inspecting work, and the methods of reporting rejections, the nature of extra work done on rejected work not entirely scrapped, and outlining betterments both as to facilities and methods, as will result in decreases in rejections.

Results Obtainable:

a Reduces cost of processing, through detecting imperfect work before expensive processing has been performed.

b Salvages parts which can be repaired or used for other purposes.

c Locates untrained workers where their work is constantly rejected, and training them to perform properly.

d Indicates equipment, tools or fixtures which turn out imperfect work, so that it can be improved.

e Locates material which cannot be properly processed, so that it can be rejected and replaced.

f Improves quality of product.

g Permits more rigid control of production, and provides production department with more positive basis for such control.

h Permits improved control of materials-in-process and to be stocked, since through inspection, counts can incidentally be made and verified.

i Eliminates, through checking and inspection, misplacement and loss of material and parts in process.

j Provides incentives to workers for better workmanship and higher quality, instilling in them a sense of pride in their work.

k Indicates possibility of improvement in handling facilities and methods, preventing breakage in handling.

l Indicates possibilities for improved processes and need for establishment of tolerances and manufacturing standards.

m Provides basis for establishment of standards of practice and manufacturing as to methods, materials, use, and quality.

n Reduces rejections made by customers, and shipments of rejected goods, saving freight and transportation expense.

o Indicates unnecessary and expensive processing, where manufacturing is held to close tolerances and where less exact dimensions will serve just as well.

E 8. Provide Proper Tool Rooms

Described as:

STUDYING the provisions made for location and placement of tools; the tool records; the tool system for giving out tools, and assuring their return; the toolmaking and repairing; the conditions of tools at machines and benches and in tool rooms; all to serve as a basis for developing recommendations looking toward increasing the efficiency of tool facilities and methods.

Results Obtainable:

a Develops actual economies in cost of tools, due to less breakage, less obsolescence and less actual loss of tools themselves.

b Provides a means whereby tools can be made, ground and maintained, according to standard shapes, and the latest practice.

c Concentrates work of toolmaking and tool repairing, grinding and sharpening, having such work performed most efficiently and economically, eliminating the necessity of machine operators dressing tools, thereby eliminating expensive machine idleness.

d By concentration, makes entire proposition worthy of careful study as to methods, tool steels and cutters used, and design, in all of which actual economies can usually be made.

e Assures necessary tools being ready for machine operators when they need them, thereby eliminating interruptions, and provides a basis for production department to more effectively plan, schedule and control production.

f By example, encourages orderliness and thrift in workers.

g Reduces accident hazard.

h In many cases, by concentrating tools all in the one place, space is saved in shop layout.

E 9. Create Best Working Conditions

Described as:

ANALYZING elements such as lighting, heating, ventilation, toilets, washing facilities, locker arrangements, cleanliness and or-

deiliness of plant, crane service, trucking, material supply at machines, condition of equipment and tools, and reporting on suggested betterments which will make the plant a better place to work in.

Results Obtainable:

a Increases actual efficiency of workers, resulting in an increased production output, and reduced cost per unit.

b Creates better spirit of cooperation toward employer, and among present workers.

c Draws to the employer a better class of workers, making employment particularly desirable to higher grade men.

d Reduces labor turnover and expense of hiring.

e Produces an actual savings in cost of training of new men.

f By example, encourages orderliness and higher quality of work among all workers

g Reduces accident hazard.

h Eliminates congestion and disorder, allowing for better use of space; in some cases making available certain unoccupied space to be used for other productive purposes, and which in some cases can be sublet.

i Eliminates dissatisfied and disgruntled workers and provides against labor agitation.

j Provides a basis which facilitates better planning, scheduling and controlling of production.

k Educates workers and secures their co-operation, in developing necessary records and methods for management control.

E 10. Outline Proper Use of Female and Common Labor

Described as:

STUDYING the nature of the operations performed; the class of labor employed; the degree of skill and strength required, and reporting where better use can be made of female and common labor to replace the more skilled male workers.

Results Obtainable:

a Reduces actual production costs, through using cheaper labor on work which it can best perform, conserving higher class and higher priced labor to be applied where it is most needed.

b Increases production, because on certain operations female workers are found to be better adapted, even though less skilled.

c Reduces labor turnover where a greater number of the more plentiful and more easily secured help can be applied.

d Creates a spirit of contentment and satisfaction among all workers when they are more happily adapted to their work.

e Through specialization, facilitates the planning, scheduling and controlling of production.

f Reduces actual cost of hiring where job requirements are fully defined.

E 11. Investigate Material Handling

Described as:

ANALYZING the facilities and methods used in connection with the matter of shop transportation and conveying as to nature of materials handled, lengths of travel, equipment used in the movement of materials, material stations or depots, arrangement of stock rooms and other factors affecting material handled, and recommending ways and means for increasing the efficiency of this work.

Results Obtainable:

a Savings in actual dollars and cents, a reduction in lost and broken material or that which is spoiled in handling; also in such items as general shrinkage and wastage.

b Increases turnover of investment in materials.

c Saves in actual handling costs.

d Increases production and reduces cost of producing, by eliminating idleness of machines waiting for materials.

e Decreases investment in material cost of work-in-process.

f Improves carrying out delivery promises.

g Permits of a definite control in movement of materials, thereby facilitating the planning, scheduling, and controlling of all production.

h Facilitates inspection of incoming material as well as material-in-process, resulting in savings in rejected materials.

i Improves quality of product, permitting better inspection and reducing damages in handling.

j Reduces congestion and therefore, fire hazard.

k Reduces accident hazard.

l Helps to develop better basis for purchasing, oftentimes making it possible to economically purchase in quantities.

m Facilitates possibility of current analysis of material used, indicating opportunities for standardization and resultant economies.

n Encourages orderliness and thrift by example to all workers.

o Makes happier and more contented workers of present employes; in some cases improving working conditions.

p Eliminates expensive manual labor in handling, by substituting wherever possible, mechanical and electrical equipment, with which it can be done more quickly, more cheaply and to the greater satisfaction of all workers.

q Eliminates congestion, thereby providing surplus space which can be devoted to other production, or sublet at a profit.

E 12. **Organize Research and Experimental Work**

Described as:

OBSERVING how new designs, changes in designs, and suggestions as to betterments in products are handled, as well as the experimental and research work in connection therewith, and then developing recommendations covering the organization and better handling of this function.

Results Obtainable:

a Reduces the cost of production, by developing designs which can be produced more economically with existing plant facilities.

b Indicates where quality can be improved.

c Indicates where usefulness of product can be broadened, thereby opening new fields for its sale and distribution.

d Eliminates, through possible standardization, expensive interruptions in processing and in production schedules.

e Eliminates confusion and arguments relative to proper design, changes and improvements.

f Brings to bear highest talent available concentrating on these problems, and eliminates haphazard judgment of such individuals in the organization who have neither the ability nor time to devote to these problems.

g Points the way to new products and new lines which may become highly profitable.

E 13. Ascertain By-Products

Described as:

ANALYZING wastes naturally incident to regular manufacturing processes as distinct from preventable wastes; classifying them, ascertaining characteristics and disposition of waste materials and carefully studying where opportunities may exist for developing by-products, which can be manufactured and marketed at a profit.

Results Obtainable:

a Indicates possibilities of elimination of certain losses through material wastes in process.

b Establishes better basis of judgment of management, by setting up standards covering unavoidable wastes.

c Reduces actual wastes, through setting up objectives from such standards.

d Capitalizes waste from one product, by applying it as by-products.

e Capitalizes waste, by studying sales possibilities and more advantageous markets and uses for it, outside of present organization.

f Indicates possibility of extending line of product, thereby opening new markets.

g In some cases, indicates possibilities of savings in materials by using such materials as will result in less waste.

h Indicates possible savings in production costs, where other materials on which effort and labor has been expended might be used with less waste of rejected parts.

i By example, encourages orderliness and thrift of all workers as well as personnel of management.

E 14. Establish Time Study Campaigns

Described as:

ORGANIZING the work of making or directing the making of scientific stop watch time studies, as the basis for determining standard hourly production or for purposes of rewarding workers in proportion to individual attainments, or both.

Results Obtainable:

a Establishes basis for absolute control of all plant production and capacity.

b Provides a basis for better assignment of work to machines most fitted for it, and on which it can be performed most economically.

c Facilitates actual routing of work through the plant.

d Provides basis for absolute planning, scheduling and dispatching of work.

e Establishes basis for absolute control of current production.

f Eliminates all confusion and arguments as to quickest methods for performance of work, and as to length of time given operations should take.

g Establishes basis for better judgment of plant management.

h Establishes basis for more effectually assigning materials to working places.

i Indicates possibilities for improvement of processes, machines, cutting tools, jigs and fixtures, handling methods, and materials.

j Aids in keeping delivery promises.

k Provides basis for establishing standard practices which will insure high quality.

l Provides basis for fair dealing with individual workers, establishing definite basis for judgment, as against haphazard judgment and guesswork.

m Indicates efficient workers who should be properly rewarded, as well as those less efficient and untrained who need further training and coaching.

n Provides basis for application of bonus premium or task plan of rewarding workers, in proposition to their individual abilities and efforts.

o Provides one factor very necessary in developing basis for proper estimating of new work.

E 15. Eliminate Operation Wastes

Described as:

MAKING scientific studies of various operations by observation, or with a stop watch or both, as the basis for determining lost motion, excessive handling, loafing, carelessness, and such other wastes as a careful study would reveal, as the basis for recommending such betterments as would tend to eliminate the faults.

Results Obtainable:

a Actually saves money in reducing operating costs.

b Establishes basis for betterments which will increase production.

c Indicates possibilities for elimination of fatigue of workers, thereby increasing efficiency and improving working conditions.

d Indicates possibility of improvements in processes, handling methods, machines, cutting tools, jigs and fixtures, layouts, and materials used in production.

e Indicates possibility of change in design of product which will improve its quality, broaden its application, and in some cases, widen its field of distribution into other markets.

f Establishes basis for standardization of processes, equipment, tools and ma-

terials, with the resultant changes to come from this.

g Reduces waste in materials used.

h Reduces expensive breakdowns and idleness of equipment.

i Reduces cost of tools and tool set-up time.

j Indicates most efficient and industrious workers as compared with those who are not applying themselves.

k Reduces rejections and poor quality of work.

l Establishes improved basis for training workers, as well as selecting for vacancies those most adapted to each specific job.

m Eliminates much confusion, many arguments and haphazard judgment regarding best methods, equipment and facilities of production.

n In many cases reduces fire hazard.

o Usually reduces accident hazard.

E 16. Prescribe Engineering and Drafting Department Procedures

Described as:

STUDYING the methods, facilities and procedures in the Engineering Department and drafting room, as to designs, drawings, tracings, sizes and kinds of prints, instructions, specifications, coordination with other departments, all to serve as the basis for recommendations covering betterments.

Results Obtainable:

a Indicates possibility of reduction in overhead expense.

b In many cases provides more definite instructions to plant which reduces actual production costs.

c By improving class of blue prints and instructions, eliminates many errors and the cost of their correction.

d For same reason, in many cases reduces rejections of completed parts or completed products, including saving of material and work performed on such products; eliminates much waste time spent in arguments, and the laborious studies of imperfect or incomplete instructions.

e By designating tolerances, and through accurate design and instruction, quality of product is improved.

f By studying facilities of plant, engineering department can design and specify product in such a way as will permit of most economical production, with such existing facilities.

g In engineering department itself, work can often be concentrated and specialized so that most expert designers can be applied to most important work, and cheaper men be used on tracing and simple drafting.

h In many cases changes of design, after production is started, can be reduced to a minimum, thus eliminating expense of interruptions in production schedule.

i By proper planning, scheduling and controlling of work of engineering and drafting departments, and coordinating them with production department, much

expensive idleness of equipment waiting for instructions and blue prints can be obviated.

j Facilitates entire planning, scheduling and dispatching of all production.

k Facilitates better basis for delivery promises, and also improves possibilties of meeting such promises.

l Facilitates inspection, by providing proper standardization of design and complete instructions.

m Eliminates much expensive field work necessary to repair or change errors in shop.

E. 17 **Stimulate Standardization**

Described as:

MAKING thorough analysis of conditions in connection with:

1. Product
2. Equipment
3. Tools
4. Materials

and then developing outlines covering the physical betterments as to each, which when adopted, can constitute standard practice.

Results Obtainable:

a The analysis itself indicates possibilities for improvement and many economies, described in detail in other places in this book.

b Improves the quality of product and broadens its field of application and use as a rule.

c Eliminates all confusion and arguments as to practices and all haphazard judgment which may or may not be correct.

d Provides a basis and starting place for researches and experiments of all kinds for continuous future improvements in processing facilities and product.

E 18. **Define Limits and Tolerances**

Described as:

ANALYZING nature of product manufactured, inspection data, standards as to finish, instructions on drawings, equipment of gages and tools, interchangeability, extra work necessary in assembling and erection; and with the above as a guide, developing reasonable limits and tolerances for the machining of various parts and getting this information in proper condition for use.

Results Obtainable:

a Improves quality of product.

b Reduces cost of production per unit.

c Usually facilitates assembling, and increases efficiency of that operation.

d Facilitates inspection.

e Furnishes instructions to workers, eliminating confusion, arguments and haphazard judgment.

f Gives workers and all concerned a goal to shoot at, making their work more interesting.

g In many cases reduces cost of special gages, tools, jigs and fixtures.

h Establishes fair basis for intelligent judgment of accomplishment of workers.

i Provides definite instructions for training new workers.

E 19. Adopt Best Product Design

Described as:

STUDYING product, methods of manufacture, uses to which product is put, requirements of trade, and with this as a guide, developing a program of better product design which will give due consideration to adaptability, interchangeability, standardization, utilization of present equipment, proper specifications of material, and proper finish allowances.

Results Obtainable:

a Improves quality of product, thereby increasing sales, and reducing rejections and returned goods.

b Widens field of distribution and new applications for product, and develops new markets.

c In many cases reduces cost of production.

d In some cases reduces cost of materials used.

e Facilitates inspection.

f Eliminates much confusion, arguments, and haphazard judgment.

g Reduces cost of field work, correcting errors.

E 20. Define Materials Specifications

Described as:

STUDYING the important materials used in manufacture of the product; ascertaining requirements on such material, and from this working up a complete set of material specifications which can be used as the basis for more economical use and more intelligent purchasing and as a guide in inspecting materials as they are received.

Results Obtainable:

a Usually reduces cost of materials used in product.

b Improves quality of product, increasing its sale, and broadening its field of distribution.

c Reduces obsolescence of material.

d Eliminates much waste of material.

e Facilitates inspection.

f Reduces rejections and bad work.

g Makes possible more economical purchase.

h Develops improved material control, assuring necessary materials being available when needed.

i Furnishes basis for improved production control.

j In many cases facilitates production and reduces manufacturing costs.

E 21. Install Chemical and Physical Laboratories

Described as:

ANALYZING the requirements and specifications of materials purchased, and determining to what extent chemical and physical laboratories would be of advantage in testing incoming materials; securing figures as to probable cost of installing such laboratories, and if decision is in favor of installing them, directing the work of organizing same and determining procedures.

Results Obtainable:

a Improves quality of product.

b Usually reduces cost of material used in product, thereby increasing sales and distribution.

c Facilitates inspection.

d Reduces rejections and returned goods.

e Eliminates much expensive field work, repairing and replacing.

f Reduces material waste and obsolescence.

g Facilitates more economical purchasing.

h In many cases, facilitates production and reduces production costs.

i Eliminates considerable idleness of equipment waiting for material, which at the last minute is found defective.

E 22. Survey Plant Location, Design and Construction

Described as:

STUDYING product manufactured or to be manufactured, sources of raw material, sources of labor, living conditions, shipping facilities, and with the above as a basis, advising as to matters in connection with location of plant and its design of construction, making, if necessary, such surveys of definite localities as may be necessary, and in addition, determining the favorable features in connection with particular designs and constructions.

Results Obtainable:

a Makes possible most economical manufacturing costs for materials, labor and overhead.

b Points out possibilities of securing advantages over competition in delivery possibilities, bringing plant closer to market.

c Points out possibility for improving living conditions of workers, thereby reducing turnover, securing higher class and more efficient workers, improving relations

between employer and worker, and developing greater contentment.

d In some cases, through getting closer to source of supply of raw material, current investment can be reduced, and turnover of this investment increased.

e Entire investment for complete plant facilities can be considerably reduced, releasing part of the money for expanding business or for investment elsewhere.

f Makes it possible to expand plant and thereby increase production and reduce costs.

g Keeps fire hazard at minimum.

h Keeps accident hazard at minimum.

i Insures best plant layout, better routing of materials and products, and cheaper operations.

j Offers best basis for production control.

k Furnishes possibility for best material control, through proper storing facilities and more direct movement through the plant.

l Facilitates keeping delivery promises.

m Where a plant can be brought close to the market, improves possible service to customers.

F Production Control

F 1. Standardize Hourly Production Rates

Described as:

ANALYZING the various operations as to the nature of work done and equipment used, and from estimates by foremen, from records of past performances, and assisted by the experience of the engineers, determining attainable standards as to hourly productions, along with description of the conditions existing at the time rate was set.

Results Obtainable:

a Provides basis for increasing and balancing production.

b Furnishes one of the most important factors in making estimates of work.

c Facilitates cost control.

d Indicates possibility of economies and improvements in operations.

e Provides a basis for establishing incentive payment plans to workers, on individual effort basis.

f Insures fair and intelligent judgment of individual worker's accomplishment.

g Insures fair and intelligent judgment of departmental accomplishment.

h Indicates any lack of capacity of either workers or machines.

i Insures fuller utilization of man and machine capacities.

j Eliminates congestion in movement of product through the plant.

k Reduces direct labor costs.

l Improves relationship between workers and department heads.

m Facilitates planning, scheduling, dispatching and controlling of production.

n Eliminates much confusion, arguments and haphazard judgment, in assignment of work, and the use of plant capacity.

F 2. Organize Material Storage, Records and Control

Described as:

STUDYING material situation as regards storerooms and their safeguards; handling of materials in storerooms; the nature and handling of stock records, methods of requisitioning materials from stock and returning to stock materials not used; how balances are checked; how maximums and minimums are determined; whether money values are used on stock records and requisitions, and with this analysis as a basis outlining the latest practice which should be developed, also organizing for the most efficient control of materials.

Results Obtainable:

a Prevents many actual losses in materials.

b Decreases inventories.

c Reduces actual spoilage.

d Checks many of the usual wastes.

e Facilitates carrying proper material costs.

f Makes possible development of monthly profit and loss statements.

g Reduces delays in production, due to waiting for stock or materials.

h Indicates possibility for improvement in material handling, and reduction of costs in material handling.
i Saves space and storage of material, in some cases making such space available for other use, or for subletting it at a profit.
j Facilitates locating material promptly when needed.
k Improves relationship between operating department and purchasing and storage department.
l Improves basis for estimating on new work through furnishing accurate data of material cost prices and availability.
m Facilitates economical purchasing.
n Assures material being on hand when needed and a definite knowledge of shortages.
o Facilitates planning, scheduling, dispatching, routing and, in fact, entire control of production.
p Facilitates inspection.

F 3. Prepare Bills of Material or Parts Lists

Described as:

ANALYZING the nature of the product, methods of manufacture, kind of bills of material in use, and devising such betterments as may be necessary to present material specifications in the most efficient manner as to the logical arrangement of major and minor groups and parts, with due reference given to titles of groups and parts, pattern or part number, and symbols to be used in requisitioning materials.

Results Obtainable:

a Simplifies purchasing.

b Reduces actual production costs, through assuring quality of material which can be machined most effectively.
c Increases capacity of plant where material can be specified, which will process more quickly and effectively.
d Usually improves quality of product.
e Reduces spoilage, defectives and rejections.
f Assures prompt ordering and improved follow-up of purchasing.
g Permits improved and accurate costing of work.
h Reduces much confusion and arguments between purchasing department and plant, due to the use of haphazard judgment.
i Facilitates inspection.
j Forms basis of accurate planning.

F 4. Provide Operation Analysis

Described as:

STUDYING operation data and working up standard procedure showing operations in sequence, operation symbols, departments affected, and data as to best and alternate machine or bench where work will be done, material stations, set-up times, and standard hourly productions for best and alternate machines or benches, material specifications and other pertinent data in connection with operations performed.

Results Obtainable:

a Reduces direct operation and production costs.
b Assures best sequence in performance of operations.
c Facilitates routing work through a plant, and utilization of most economical machines.

d Provides basis for improved planning, scheduling, dispatching and controlling of plant capacity.
e Reduces expense of idleness of plant capacity.
f Facilitates prompt tool deliveries and control.
g Decreases usual set-up time.
h In many cases decreases investment of small tool equipment.
i Indicates overloaded or underloaded equipment and machines.
j Usually decreases material and product handling costs.
k Facilitates more balanced production, and more regular production intervals.
l Improves labor and departmental relationships.
m Reduces congestion and facilitates keeping delivery promises.
n Reduces loss of material due to either congestion or breakage.
o Facilitates inspection.
p Provides an important factor, in more definite estimates of prospective work.

F 5. Develop Tool Analysis

Described as:

STUDYING the tool data and working up standardized procedures showing operations in sequence for a given part; description of tool, code number of tool, number of tools available, where used and the location, and the tool crib number.

Results Obtainable:

a Reduces loss of tools.
b Improves tool design.
c Expedites handling and moving of tools and tool service to machines.

d Reduces actual production costs, and in many cases length of time for individual operations.
e Lowers cost of making tools, as well as maintenance of tools.
f Improves quality of work finished.
g Insures work being done with tools in proper condition for highest efficiency.
h Insures most effectual use of machines and entire plant capacity.
i Eliminates congestion in tool storage.
j Reduces loss of expensive tools.
k Facilitates planning, scheduling, and controlling of equipment.
l Improves relationships between workers and foremen.
m Reduces amount of space necessary for tool storage in many cases.
n Reduces cost of tools.
o Eliminates much confusion and arguments, and haphazard judgment as to use and application of various tools.
p Assures the use of machines to their highest speeds and feeds.
q Eliminates much abuse of machine capacity, and reduces repair and maintenance costs.
r Extends life of machines and tools.

F 6. Refine Dispatching and Timekeeping

Described as:

ANALYZING the methods in use in keeping record of time spent on work and in dispatching jobs to machines and working places, and developing such methods for keeping time of equipment and workers as will provide information regarding good and bad work produced; showing standard hourly productions against which performance can be measured; recording

the cost of time taken for work done, showing what men and machines are working on, what work is to come next, arranging for the movement of material, and providing that things needed are in readiness for next jobs.

Results Obtainable:

a Reduces direct and indirect labor costs.
b Makes it possible to accurately account for all time put in on production.
c Facilitates better balancing of plant capacity.
d Eliminates much expensive idleness of plant capacity, reducing delays.
e Insures that materials and tools are ready for use by the worker, at the proper time.
f Facilitates the control of production.
g Reduces amount of work-in-process.
h Decreases spoilage.
i Insures proper count in inspection.
j Insures proper use of machines on given operations.
k Insures proper sequence of operations.
l Reduces over-all time in putting product through the plant.
m Points out many possibilities of economies not otherwise discernible.
n Indicates condition of the progress of each job at every step.
o Reduces delays of workers waiting for orders or instructions, keeping jobs ahead to the fullest extent possible.
p Facilitates the keeping of delivery promises.
q Improves relationship between worker and foreman.
r Facilitates better foremanship.
s Prevents many errors in payroll.

F 7. Analyze Purchasing, Traffic and Receiving

Described as:

STUDYING the methods in connection with purchasing, traffic and receiving, as a means of developing ways to anticipate requirements to better advantage, following up purchases more efficiently, and arranging for a better receiving and inspection of materials.

Results Obtainable:

a Improves purchasing.
b Develops better follow-up for delivery.
c Facilitates storage and material control.
d Reduces cost of receiving.
e Facilitates inspection and reduces inspection costs.
f Usually eliminates many delays in operations awaiting materials.
g Decreases inventories.
h Reduces over-purchase.
i With proper specifications and combination of similar items, usually permits more economical purchasing, and reduces material costs.
j Establishes basis for more accurate accounting.
k Facilitates prompt location of materials.
l In many cases results in higher quality of material being available.
m Eliminates much spoilage, wastage, shrinkage and obsolescence.
n Assures receipt of all material paid for.
o Facilitates detection of materials of improper quality, design or variations from specification.

p Reduces time wasted searching for misplaced and lost materials.

q Reduces expensive idleness of machines waiting for materials.

r Improves relationships between buyer and source of supply.

s Facilitates keeping delivery promises.

t Improves planning, scheduling, dispatching and controlling of production.

u Provides improved basis for costing and pricing product.

F 8. **Institute Inventory of Hours of Labor Ahead**

Described as:

ANALYZING work on hand in hours, according to class of product, department and nature of equipment, and arranging for a current and continuous inventory of work to do, the basis of which will be advanced notice of conditions, whether normal, or congested or excess capacity, all of which will be valuable in both planning and selling.

Results Obtainable:

a Improves executive control.

b Facilitates the use of all available capacities, eliminating much expensive idleness.

c Lowers direct labor costs.

d Facilitates keeping delivery promises.

e Makes possible balanced production.

f Aids in the reduction of work-in-process.

g Facilitates keeping of jobs and operations in proper sequence.

h Aids in making available knowledge as to whereabouts of each job.

i Facilitates planning, scheduling, dispatching and controlling of all work.

j Improves relationship between workers and management.

k Indicates possibility of reduction of indirect labor costs.

l By planning labor requirements well in advance, facilitates employment of better workers.

m Reduces overtime and expensive "extra hour" work.

n Improves foremanship.

F 9. Establish Order Progress Records

Described as:

STUDYING means employed to watch progress of orders as to work done and arranging to show in the most comprehensive manner the exact condition of any part, group, or order in its entirety.

Results Obtainable:

a Facilitates planning, scheduling, dispatching and controlling of production.

b Reduces work-in-process.

c Gives definite knowledge of status of each job.

d Facilitates keeping operations and orders in their proper and most economical sequence.

e Facilitates keeping delivery promises, and where doubtful, indicates advisability of extra production or changes in schedule.

f Reduces necessity for expensive overtime and "extra hour" work.

g Usually results in lowered costs for assembly and shipping.

h Eliminates much expensive idleness of plant capacity.

i Improves service to customers, both as to intelligent and positive information and better deliveries.

j Eliminates much confusion, congestion and arguments regarding deliveries and progress, as well as arbitrary guesses and estimates on the part of foremen and other executives.

k Improves foremanship.

l Improves relationship, and establishes spirit of cooperation between workers and management, replacing old driving tactics of supervision.

m Eliminates much need for order chasing, and in this way reduces actual overheads.

n Improves relationships between sales and operating departments.

o Prevents many cancellations.

p Discourages expensive changing from one job to the other.

q Establishes basis for more intelligent decisions as to future program and policies.

r Establishes intelligent basis for decision as to need of increased capacity, and often prevents purchase of unnecessary additional equipment.

F 10. Install Graphical Planning and Scheduling

Described as:

STUDYING methods in use for planning and scheduling production, as a basis for developing graphic presentations showing what

has been scheduled, material on hand, standard hourly productions, ratio of performance to standard, whether work is behind or ahead of schedule, and reasons for failures to produce according to schedule.

Results Obtainable:

a Improves planning, scheduling, dispatching and controlling of production, coordinating all factors in a comprehensive way.

b Encourages and facilitates the use of information available.

c Insures more intelligent executive decisions.

d Improves executive control.

e Reduces amount of detail and burden to be handled by executives.

f Improves deliveries.

g Facilitates making definite delivery promises.

h Facilitates keeping delivery promises.

i Offers basis for definite dispatching and assignment of work to each machine.

j Reduces expensive idleness of unused capacity, emphasizing such idleness for prompt executive attention.

k Indicates reason for idleness, separating the inefficiencies of workers from those of management by showing the idleness caused by worker because of waits for material, tools, instructions, equipment, as well as any other factors.

l Reduces product cost.

m Usually reduces overhead.

n Facilitates routing of work in proper sequence, and points out where work would be most economically produced.

o Reduces over-all time for work to go through plant.

p Reduces work-in-process.

q Increases production.

r Permits of smaller inventories, to secure same results.

s Facilitates improved purchasing.

t Offers better basis for improved costing and accounting.

u Furnishes current analysis and the control of labor costs.

v Facilitates payment of wages according to incentive plans.

w Offers valuable sales data for use of sales department.

x Usually results in improvement and standardization of production methods, processes, facilities and materials.

y Improves service to customers, both as to information and deliveries.

z Establishes better relationship between sales, operation, purchasing, engineering and accounting departments.

aa Establishes basis for more intelligent decisions as to future program and policies.

bb Indicates without argument and confusion when increased capacities are necessary.

cc Eliminates purchase of unnecessary additional equipment, or of unnecessary investments in plant extensions.

dd Eliminates much unnecessary overtime and "extra hour" work.

ee Offers more intelligent basis for better judgment by foremen of workers.

ff Eliminates many arguments, much confusion and haphazard judgment on the part of executives, foremen and workers.
gg Improves foremanship.
hh Improves industrial relations between management and workers.
ii Assures more contentment and satisfaction among workers.
jj Usually results in higher grade personnel and reduced labor turnover.

G Personnel Control

G 1. Determine Basic Wage Rates

Described as:

STUDYING underlying considerations in setting the basic hourly wage rates, and from this developing a means whereby analysis of rates for the various kinds of work may be made, with due reference to cost of living in the district, transportation facilities for employes, conditions of the work, time necessary to become skilled, and degree of strenuousness, all to serve as the basis for setting minimum and maximum wages.

Results Obtainable:

a Establishes basis for intelligently deciding legitimate wage rates, in proper proportion to the requirements of the workers and the economic conditions in the industry.

b Assures the workers a "square deal" and a satisfactory living wage.

c Reduces labor turnover.

d Attracts a higher grade personnel of workers.

e Simplifies and facilitates selection and employment.

f Reduces arguments, confusion and haphazard judgment regarding wage rates.

g Tends toward better foremanship.

h Establishes basis of contentment and satisfaction among workers.

i Provides basis for fair and intelligent discussions in instances where collective bargaining is resorted to.

j Provides for necessary factors needed for intelligent estimating of cost of productive work.

k Establishes current comparisons of analysis to prevent acceptance and pricing of work on an uneconomical basis, eliminating certain losses.

G 2. **Install Incentives**

Described as:

STUDYING methods in use to provide incentives to workers, and from this developing such plans as will reward workers in proportion to individual attainment, the basis of which will be the determination of fair standards of performance, the efficiency of each worker to be ascertained by comparing actual results against these standards, and paying extra amounts accordingly.

Results Obtainable:

a Provides basis for rewarding workers over and above a necessary living wage, in proportion to individual efforts for additional production.

b Provides basis for determining which workers are not as well trained or efficient as others, and supplying them with necessary training and coaching, or else transferring them to operations where they can be most effective.

c Assures every worker a fair and intelligent consideration and judgment.

d Eliminates arguments, confusion, and haphazard judgment, as to the relative worth of various workers.

e Assures a labor cost in proper proportion to production.

f Increases production for a given overhead, thereby reducing unit cost for overhead.

g Secures cooperation of workers in preventing any inefficiencies for which they are responsible.

h Secures cooperation of workers in reporting any inefficiencies for which they are not responsible, but which can be prevented by the management.

i Secures cooperation among workers, each helping the other in their individual efforts.

j Tends to improve foremanship by placing more intelligent information in the foremen's hands.

k Furnishes important factor, in the making of definite and intelligent estimates of cost on productive work.

l Through introducing quality bonus, can be be used to improve quality of product.

m Through introducing bonus for reduction of wastes, can become basis of savings in wastes in materials, supplies and tools.

n Encourages suggestions from workers for improvement in methods, processes, facilities, materials used, handling equipment and methods, and control procedures.

o Ties the workers to the employer, by making them financially interested in increased production.

p Reduces labor turnover, because any company paying bonus, who also maintains market price piece rates, has a distinct advantage over concern not paying bonus.

q Attracts and holds higher class workers.

r Reduces cost of training new workers.

s Facilitates employment.

G 3. Establish Personnel Efficiency Records

Described as:

ANALYZING such records as may exist, covering performance of workers in shop and office, and developing ways and means of showing the quantity and quality of attainments of individuals as the basis for paying bonuses, adjusting wages and arranging for promotions.

Results Obtainable:

a Establishes basis for intelligent and fair judgment of workers.

b Shows particularly efficient and interested workers, who should be rewarded accordingly.

c Indicates workers less efficient and less industrious, who can be trained, coached or transferred to other positions they are better qualified to fill.

d Establishes a basis for proper promotion, both in position and wages for all workers.

e Separates the inefficiencies of management from those of workers, and establishes a basis for improvement.

f Tends to improve foremanship, by placing in their hands complete information in dealing with their workers.

g Eliminates arguments, confusion, and haphazard judgment in dealing with workers.

h Improves relationship between workers and management.

i Reduces turnover by reducing number of unfair discharges.

j Points out expensive training of new workers, which in some cases can be concentrated upon and reduced.
k Attracts and holds higher grade workers.
l Gives every worker an opportunity to serve where he can earn highest wages and serve most profitably.
m Establishes an intelligent basis in discussions where collective bargaining is resorted to.
n Improves relationship and develops cooperation between workers and employers.
o Assures a "square deal" for all.

G 4. Cooperate on Education and Training

Described as:

ANALYZING methods in use to secure cooperation of workers and foremen, as well as the means employed in their training; this analysis to be used as the basis of formulating plans for training and coaching them, which will mean better, more loyal and more contented workers and foremen.

Results Obtainable:

a Secures interest and cooperation of workers.
b Lessens expense of training new workers.
c Improves foremanship.
d Reduces labor turnover, because workers will usually remain longest where they secured their training.
e Establishes better relationships and secures cooperation of workers.
f Secures suggestions from workers as to improvements in methods, procedures, processes, facilities, and other manufacturing factors.

g Facilitates employment, permitting the use of unskilled workers who can be trained in the plant.

h Improves quality of work since this feature can be included in a training course.

i Attracts and holds higher class of workers, because only intelligent ones will respond to this training.

j Brings to the front any exceptional talent, indicating the men who can be used in supervisory capacities.

5. Present Graphics to Workers

Described as:

OBSERVING to what extent performance of workers, individual and collective, as to quality and quantity, are shown to workers, as well as the nature of their presentation, and arranging for simple but vivid graphs on cards or dials, or boards, which will induce the interests of the workers and stimulate their creative instincts.

Results Obtainable:

a Secures the interest and cooperation of workers, improving relationship between them and the manager.

b Induces better foremanship when foremen know that workers are familiar with conditions.

c Insures fair judgment in dealing with workers.

d Secures suggestions as to improvements in equipment, methods, processes, procedures and other manufacturing features.

e Usually increases production and reduces costs.

f Establishes better team play among workers themselves, by setting a common objective.

g Brings into the work a new interest, which makes for contentment and satisfaction.

h Attracts and holds most intelligent workers by inducing greater interest in their jobs, thereby reducing labor turnover.

i Brings out particularly good talent, indicating workers who may be used in supervisory capacities.

j Brings an element of "sport" into the everyday work.

G 6. **Organize Employment Department**

Described as:

OBSERVING the methods followed in employing labor, and with this as a basis, developing for the existing conditions, the best methods to follow in organizing employment department, methods of interviewing applicants, placing those engaged, employment records, and other factors entering into the work.

Results Obtainable:

a Reduces cost of securing and selecting workers.

b Insures maintaining a balanced force, and facilitates controlling and maintenance of a balanced production.

c Eliminates much expensive overtime and "extra hour" work.

d Facilitates keeping delivery promise by maintenance of an organized force.

e Reduces overhead through proper selection.

f Insures efficient workers through proper selection according to job requirements.

g Eliminates possibility of the entrance of undesirables in the plant organization.

h Provides basis for studying labor conditions outside of plant and, with this as a basis insuring fair dealings with workers.

i Reduces labor turnover by devoting sufficient time to select men who are adapted to work, and who will remain.

j Reduces cost of training workers by securing men most adapted to work to be done.

k Reduces production labor costs by securing men most quickly able to adapt themselves to new work.

l By having applicants available when unusual demand for more workers comes, new gangs and departments can be most quickly organized, resulting, as a rule, in considerable savings.

m Facilitates entire control of production through assuring the proper labor supply.

n By providing impartial judgment, insures "square deal" to the worker, and improves relationship between worker and employer.

o Provides medium for study and standardization of wage rates.

p When labor is scarce, attracts best workers who will when they have a choice, go to that concern which is reputed to give careful and intelligent consideration to all applications.

q When labor is plentiful, insures the selection of the best available because of careful analysis in selection.

G 7. Capitalize Suggestions

Described as:

DEVISING ways and means of securing suggestions from workers, determining the nature of rewards to be offered, handling suggestions received, and the steps necessary to get the value from those accepted.

Results Obtainable:

a Secures valuable suggestions for improvement of methods, processes, equipment, design, handling facilities, and other features of manufacture.

b Brings to light any exceptional talent which can be used most effectually, and in some cases in a supervisory capacity.

c Secures and maintains the interest and cooperation of workers.

d Improves relationship between workers and management.

e Induces better foremanship, instituting an indirect check on foremen.

f Points out for correction and separation, inefficiencies of management as against those of the workers.

g Attracts and holds higher grade and most intelligent workers, and thereby reduces labor turnover.

h In many cases results in actual cost reduction.

i In many cases results in improvement of quality of product.

G 8. Institute Safety Campaigns

Described as:

OBSERVING the nature and scope of safety measures, and developing the policy and program looking toward a safety campaign which will reduce preventable accidents to the minimum.

Results Obtainable:

a Saves lives and suffering among workers.

b Reduces cost of liability insurance.

c Prevents disruption of organization which occurs when particularly serious accidents happen.

d Reduces labor turnover because men remain longest where accident hazards are least.

e Attracts and holds higher grade and more intelligent workers who prefer to work under safe conditions.

f Eliminates expensive idleness of equipment caused by accident to operator.

g Establishes new interest among workers, and a common bond between worker and employer, thus improving relationships.

h Secures suggestions from workers regarding safety, which at the same time often result in increased productions.

i Establishes better relationships and team play among workers.

j Encourages improved foremanship, through inducing foremen to become more interested in the safety and general requirements of their men.

k Can be used as a basis for education, not only in safety work but in other interesting phases of the worker's daily job.

l By establishing more constant labor supply eliminates many expensive interruptions in current production, affecting not merely one policy but in some cases many where there is dependent sequence.

m By reducing interruptions, facilitates keeping delivery promises.

n Discourages radical and ignorant labor agitation from the outside.

G 9 **Arrange Employes' Committees and Representation**

Described as:

DEVELOPING the mechanism necessary in the form of shop committees and employes representation to bring about a greater degree of cooperation between workers and management, by enabling the workers to share in the responsibility of management.

Results Obtainable:

a Secures from workers, valuable suggestions for improvements of methods, processes, machines, handling facilities, material use, management and control procedures, and other important phases of manufacture.

b Through the application of these improvements, reduces costs and increases production.

c Definitely establishes and separates responsibility for inefficiencies, between management for their correction, and workers for their attention.

d Develops more satisfied and contented workers by giving them a new interest in their job.

e Improves relationship between workers, and employers.

f Gives to the workers a knowledge of the various problems and difficulties encountered by management, and eliminates unfair judgment on their part.

g Reduces to a marked degree the possibility of radical and ignorant agitation from outside influences.

h Improves foremanship by establishing an indirect check on foremen themselves.

i Brings to light any exceptional talent which can be used most effectively, and in many cases in a supervisory capacity.

j Permits workers to participate in decisions, and thereby abide by them whole-heartedly. This is valuable particularly where such decisions ordinarily seem unfair to the workers.

k Reduces labor turnover because workers will remain longest where they are most interested.

l Attracts and holds higher grade and more intelligent workers to whom this higher responsibility appeals.

m Improves relationship among workers along the line of team work, giving them certain common objectives.

n When increased production is necessary, usually secures maximum efforts of the workers.

o In times of depression, secures cooperation of workers in campaigns of cost and expense reductions.

p In many cases establishes a basis for improvement in quality.

q Usually establishes basis for campaign of waste elimination.

G 10. Prepare Job Analysis and Specification

Described as:

ANALYZING the various kinds of work performed, as the basis for preparing specifications covering job requirements and the qualifications needed in workers to match the requirements.

Results Obtainable:

a Establishes basis for most intelligent selection of workers.

b Assures each job being filled by worker most nearly qualified to fill the same.

c Reduces actual labor costs.

d Insures a fair and square judgment of workers.

e Indicates any workers qualified for more important work than that they are performing, making it possible to transfer where they can be most effectively used.

f Indicates workers not fully qualified for the job, who can be trained to fill it or be transferred.

g Insures each worker's possibility to earn to his fullest ability.

h Facilitates dispatching and assignment of workers to various operations, and makes possible more effective production control.

i Establishes basis for training courses.

j Reduces labor turnover by eliminating old "fit and try" methods of assigning men.

k Affords better basis for establishing wage rates, paying for each operation in proportion to its worth, with particular

reference to the grade of men required.

l The analysis of job requirements itself often indicates opportunities for much improvement and standardization.

G 11. Prescribe Trade and Vocational Tests

Described as:

DEVELOPING such trade and vocational tests as will enable an employment manager to match qualifications of workers with requirements of given tasks.

Results Obtainable:

a Facilitates very definitely, selection of workers, qualified to fit required positions.

b Establishes a basis for rewarding workers, in direct proportion to their qualifications.

c Assures each worker being allowed to work where he can do so most effectively and earn the best wages.

d Will indicate workers who are capable of more than the jobs they are filling and show possibilities for promotion.

e Will indicate workers who are not capable of filling their present jobs, and who need training and coaching, or who should be transferred to work they can best fill.

f Usually results in increasing production.

g In many cases results in improvement of quality of product.

h Insures intelligent and fair judgment of workers.

i Eliminates many arguments, much confusion and haphazard judgment of workers by foremen.

j Improves foremanship by placing in foremen's hands, intelligent information with which to deal with workers.

G 12. Study Insurance and Pension Plans

Described as:

ANALYZING insurance and pension plans for workers, and determining the best methods to follow covering this important phase of industrial relations.

Results Obtainable:

a Improves relationship between workers and employer.

b Develops organization of satisfied and contented workers who realize that their present and future is cared for.

c Disposes of problem of older workers, whose efficiency and productivity has gradually dropped and who should be replaced by younger men.

d Reduces turnover because workers will remain longest where their interests are best cared for, and because by leaving they will lose the value of their term of employment in future pensions, as well as present insurance.

e Attracts and holds higher grade and most intelligent workers who will remain where their interests, and that of their family in the present and future, is most cared for.

f Discourages radical and ignorant agitation from the outside.

G 13. Develop Stock Participation Possibilities

Described as:

AFTER study of a particular situation, determining the best plan and the ways and means of inducing workers to purchase stock of the company, thereby securing the interest of the employes due to their having a stake in the business.

Results Obtainable:

a Secures interest and cooperation of workers and improves relationship between them and employer.

b Secures valuable suggestions from workers as regards methods, processes, machines, product, materials, and other phases of manufacturing, which often result in higher quality, increased production, and reduced costs.

c Discourages radical and ignorant labor agitation from the outside.

d Reduces labor turnover because financial interest is an additional incentive to remain, particularly where leaving employ will mean a sacrifice of possible profits.

e Will attract and hold higher grade and most intelligent workers, who will prefer to work where greatest interest can be secured.

f During prosperous times, offers additional incentive for highest efficiency.

g During depressions, will serve to secure greater interest in cost reductions and waste eliminations.

h Will encourage workers to eliminate inefficiencies for which they are responsible.

i Will encourage workers to point out inefficiencies for the elimination of which management is responsible.

j Will bring workers in closer touch with problems and difficulties of management, and eliminate much unfair judgment and prejudices on their part.

G 14. **Introduce Foremen's Clubs**

Described as:

STUDYING the conditions in the plant as regards the direction of work by foremen, the class of men who are working as foremen; observing to what extent cooperation among foremen would mean greater results; and with the above as a basis, organizing foremen's clubs, and outlining procedures as to meetings, the subjects to discuss, addresses by outsiders, "smokers" and the like.

Results Obtainable:

a Will improve foremanship through better training.

b Will encourage foremen to take greater interest in their workers, and thereby improve relationships between workers and management.

c Will induce cooperation between foremen themselves, and thereby develop more highly coordinated organization.

d Will give foremen greater interest in their work, and reduce employment turnover among them.

e Will secure results from foremen as to improvements in manufacturing processes, facilities, use, management and control procedures, product, and other phases of manufacture.

f Will attract and hold higher grade and more intelligent foremen, giving them an opportunity for broadening themselves.

g Will bring to light any exceptional talent which can be used in higher executive capacity.

h Will indicate any foreman whose experience qualifications, or viewpoints do not fit them to successfully fill a foreman's position, and permit of their training and coaching.

i Will establish an incentive to all workers to promote themselves into foreman's position, making such positions most highly desired.

H Industrial Analyses

H 1. Organization Plan and Personnel Analysis

Described as:

ANALYZING and reporting on organization, with reference to nature of organization; its present problems and existing practices; the present plan of relationship, functions and duties; the staff and committee organizations; the organization personnel; departments and employes; office procedure; and the conduct of such departments as order, traffic and shipping.

Results will indicate means to:

a Provide maximum of executive control with minimum of expense.
b Cover all functions properly but without crossed lines of authority.
c Build up men and not develop "leaners."
d Secure proper executive cooperation.
e Provide authority to fully cover responsibilities.
f Reduce sources of friction.
g Provide proper departmentalization.
h Improve organization charts, and written functions and duties.
i Establish basis for measurement of results.
j Determine the requirements of given positions.
k Secure proper personnel and relocate those improperly placed.
l Provide basis for proper staff conferences.
m Place all correlated functions in one group.
n Plan proper lines of authorities and responsibilities.

o Eliminate lost motion.
p Secure permanency.
q Arrange divisions so that they can be filled by average executives.
r Separate incongruous functions.
s Secure concentration and specialization.
t Obtain proper organization spirit.
u Reduce indirect costs and overheads.

H 2. **Financial and Accounting Procedure Analysis** (Note: From industrial angle.)

Described as:

ANALYZING and reporting on financial and accounting practices with reference to the important financial factors; control accounts, statements and graphs; credits and collections; methods of accounting and books of entry; arrangement of and responsibility for accounting; costing of product; burdens and expenses; effectiveness, verification and use of accounting, production and cost control data.

Results will indicate means to:
a Provide proper basis for financial judgments.
b Establish budget systems.
c Provide proper monthly profit and loss statements.
d Issue monthly departmental statements.
e Establish proper departmentalization.
f Plan future financial policy.
g Arrange necessary credits schedule.
h Ascertain correct control accounts.
i Improve basic cost information flow.
j Simplify methods and eliminate unnecessary detail.
k Establish proper burden distribution policy and basis.

l Tie in estimating system with cost.
m Provide anticipative cost knowledge to prevent increases.
n Establish proper credit and collection procedure.
o Plan proper organization.
p Verify accounts.
q Coordinate production and cost control records.
r Establish anticipative cost control
s Obtain proper financial and cost data.

H 3. Product and Inspection Analysis

Described as:

ANALYZING and reporting on product and inspection with reference to nature of product, records and specifications, changes in design, drawings, standardization, material lists, numbering to facilitate requisitioning factors in connection with process and final inspection, gages and tools for inspection, inspection procedure, records as to defective and spoiled materials, and the measures used in maintaining quality.

Results will indicate means to:

a Determine most profitable lines.
b Establish best and most economical product design.
c Provide necessary specifications and plans.
d Arrange for economical policy in regard to design changes.
e Improve drawings from shop angle.
f Facilitate requisitioning and purchasing procedure.
g Establish authorities and responsibilities for inspection function.

h Arrange basis for enforcing proper inspection.

i Reduce spoilage and improve quality.

j Provide for tool, gage and first piece inspection.

k Analyze rejections; establish preventative methods.

l Assure proper salvage procedure.

m Secure certainty of proper quality.

n Arrange and simplify necessary records.

o Reduce inspection expense.

p Ascertain best materials for most economical manufacture.

q Institute standardization of product, material and parts.

H 4. Plant and Equipment Analysis

Described as:

ANALYZING and reporting on plant and equipment with reference to buildings and yards; power; machine equipment as to quality, quantity, adaptibility and non-use; maintenance and anticipative inspection; tool practices, condition and standardization, and shop transportation facilities and methods.

Results will indicate means to:

a Ascertain uses and condition of buildings and yards.

b Provide proper routings.

c Establish proper organization policy hereto.

d Indicate standardization policies with regard to buildings and equipment.

e State conditions of equipment and indicate losses in use.

f Recommend most economical equipment and construction.

g Provide anticipative maintenance procedure.
h Ascertain proper tool design and service.
i Eliminate back tracking.
j Institute tool standardization.
k Establish proper transportation methods and practices.
l Indicate proper expansion policies and provide therefor.
m Reduce cost of maintenance, direct and indirect.

H 5. Material Use and Control Analysis

Described as:

ANALYZING and reporting on materials, with reference to procurement including receiving inspection of materials received,stock records, stockrooms, and efficient physical control of materials.

Results will indicate means to:

a Determine most economical materials considering operation costs.
b Lower inspection and receiving expense.
c Provide proper specifications and tests.
d Establish proper stock control.
e Reduce inventories and space used.
f Attain more accurate costs.
g Reduce spoilage.
h Provide best storing, routing and handling.
i Control material service.
j Eliminate losses and wastes.

H 6. Production and Cost Control Analysis

Described as:

ANALYZING and reporting on production and cost control with reference to methods of ordering work, records of movement of materials, speed of production, time recording, handling of material, planning, routing, dispatching, recording progress and the relations between actual and standard performances.

Results will indicate means to:

a Ascertain proper control.
b Reduce work-in-process.
c Eliminate idleness and delays.
d Provide 'job-ahead' basis.
e Secure accurate time accounting.
f Simplify cost records.
g Attain better deliveries.
h Reduce handling cost.
i Increase operation efficiency.
j Establish wage incentive basis.
k Maintain job ahead condition.
l Improve routing.
m Provide knowledge of job-in-process.
n Secure current comparison of actual vs. standard performances and of actual vs. absorbed capacities.
o Reduce production intervals.
p Provide basis for delivery promises.
q Attain more rapid production.
r Decrease costs.

H 7. Labor Control Analysis

Described as:

ANALYZING and reporting on personnel, with reference to employment, turnover, hours, labor conditions, wage payment methods welfare effort, committees and meetings, safety, compensation and liability insurance.

Results will indicate means to:

a Ascertain proper labor policies.
b Establish safety and welfare procedure.
c Provide correct organization policy.
d Maintain proper employment records.
e Analyze and reduce turnover.
f Establish adequate personnel plan.
g Inaugurate compensation and liability insurance.
h Create company spirit.
i Establish proper wage and wage incentive plan.

H 8. Distribution Plans and Activities Analysis

Described as:

ANALYZING and reporting on distribution with reference to organization of sales department, sales policies, advertising, competitors, markets, prices, deliveries, product, profitable or unprofitable lines, catalogs, freight rates, condensing and standardizing lines, lost sales, sales analysis, new lines, general publicity, and export possibilities.

Results will indicate means to:

a Provide proper place in organization plan.
b Determine most profitable lines and standardize.

c Eliminate gradually unprofitable lines.
d Obtain proper estimating procedure.
e Secure proper basis for delivery promises.
f Determine general distribution policies.
g Inaugurate proper advertising campaign.
h Analyze competitors' products and points.
i Investigate and establish markets with regard to freights.
j Initiate literature and follow-up.
k Graphically analyze lost sales.
l Establish sales analysis.
m Ascertain new and profitable lines—domestic and foreign.
n Provide incentives.
o Reduce sales expense and increase sales profits.
p Set proper prices and adjust them.

"Knoeppel Organized Service"

What is organized service?

1. Based upon many years' contact with industrial problems in plants of great variety and scope, it is a direct and effective means of solving each client's particular problems of industrial betterment.

2. Applied through, not the judgment of one man, but the combined efforts of an organized staff, brought together after years of selection, training and coordination, each man a specialist, chosen because of outstanding experience, reputation and proven results, it brings the combined strength of all back of every contract undertaken.

How it is applied?

1st. Through calls, plant investigations and general analyses, without obligation, upon request, by Firm Members or Trained Engineers capable of quickly analyzing your requirements and briefly outlining the plan, scope and benefits of this service in your particular case. This offers prospective clients intelligent, convenient and confidential aid in considering our service, with no expense and a minimum expenditure of time.

2nd. Installation of work undertaken by asssignments of Trained Engineers, singly or in groups, directed and advised by Supervising Engineers, with all the work reviewed by Firm Members. This provides direct, positive, competent, quick and effective application of service itself.

3rd. The above groups assisted by staff organizations consisting of:

a Educational Division which selects, trains, and develops engineers for various grades, and maintains proper relationships between our staff and the client's personnel. This assures our clients of the maintenance of the high grade and definite ability of all engineers assigned, and their proper influence as related to the organizations served.

b Administration Division which handles all direct business transactions. This assures our clients of straightforward, businesslike dealings in all transactions and associations.

4th. All the above divisions are coordinated and guided by C. E. Knoeppel personally. This assures each client a coordinated, organized service.

If you are interested in the service we render, we would be pleased to furnish you complete details on any or all phases of our work upon request.

This service is applied through

Surveys and Industrial Analyses
Installation Service
Consultation Service
Technical Service
Auditing Service
Management Service
Intermittent Service
Retained Service.

Information on the above will be furnished either through correspondence, literature or calls by a Firm Member or qualified Staff Engineer at your convenience and without obligation.

We can describe our plan briefly.

Deacidified using the Bookkeeper process.
Neutralizing agent: Magnesium Oxide
Treatment Date: Aug. 2003

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